Vol. XXVI. Part 7.

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The Journal of the Department of Agriculture of Victoria, Australia.

July, 1928.

PRINCIPAL CONTENTS

Chemistry in Agriculture
Care of Ewes at Lambing Time
Orchard Drainage
Green-manuring Orchard Trees
Top-Dressing Lucerne
Parasites in Pigs
Review of the Apple Export Season
The Breeding of Poultry

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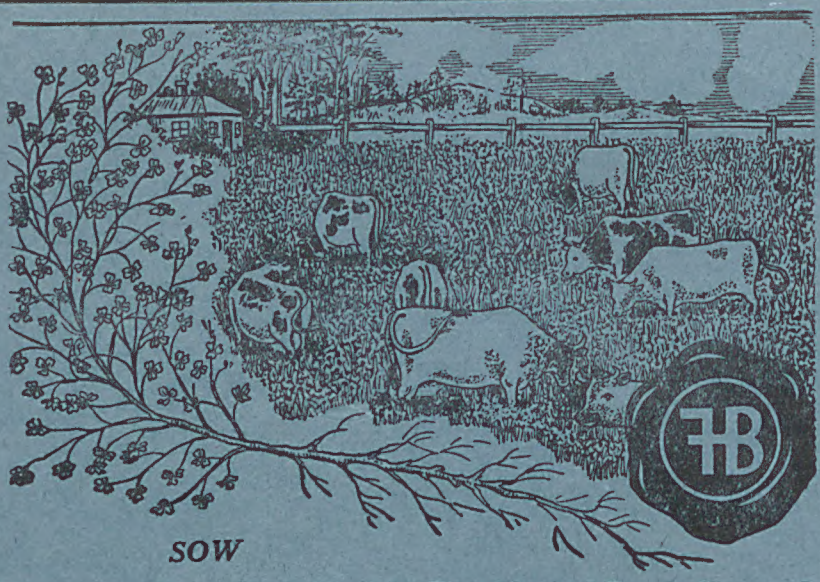

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VICTORIA, AUSTRALIA.

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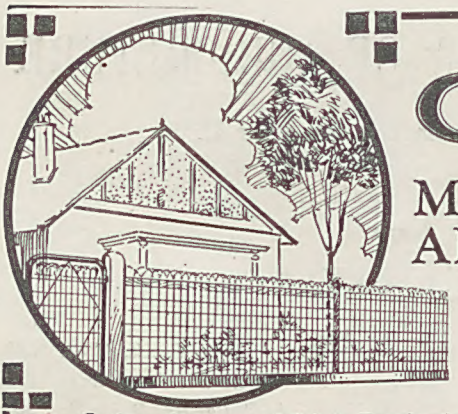

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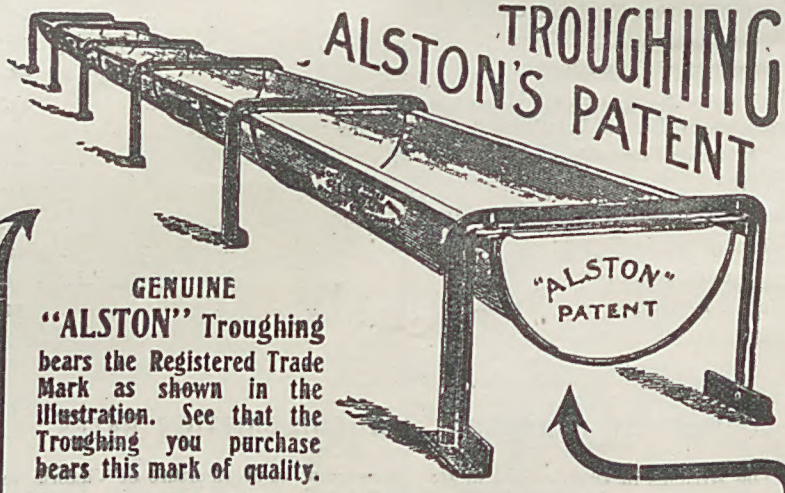

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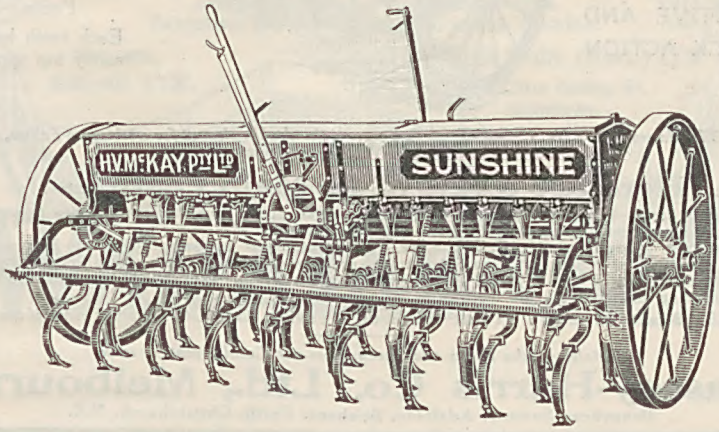

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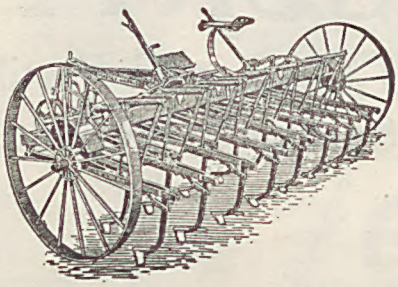

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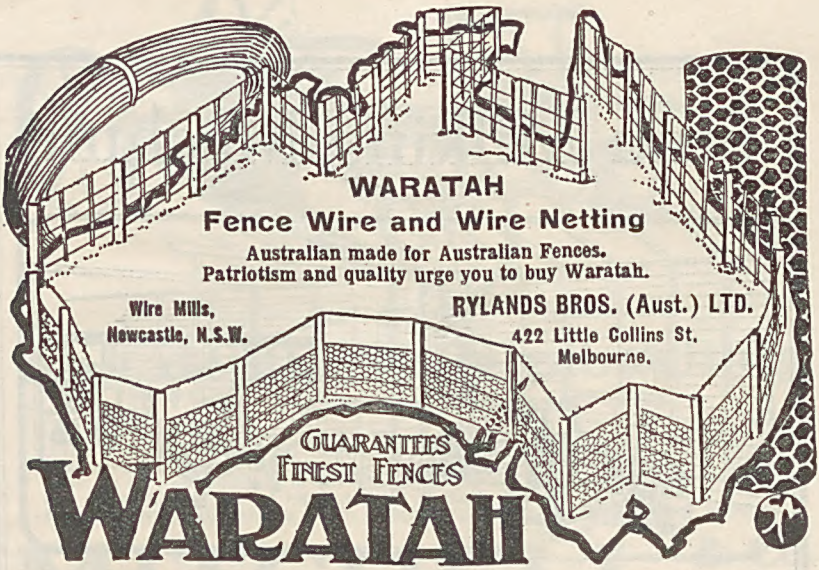

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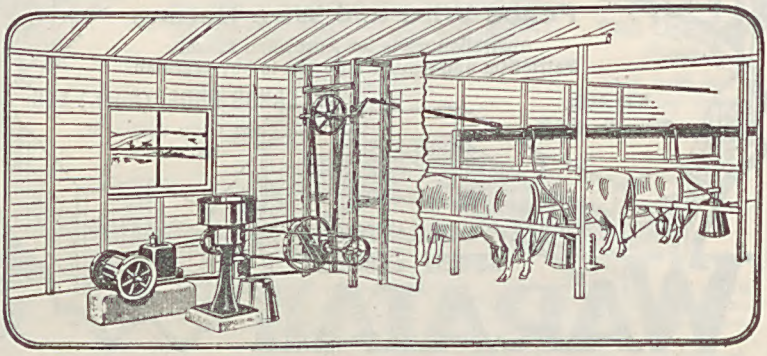

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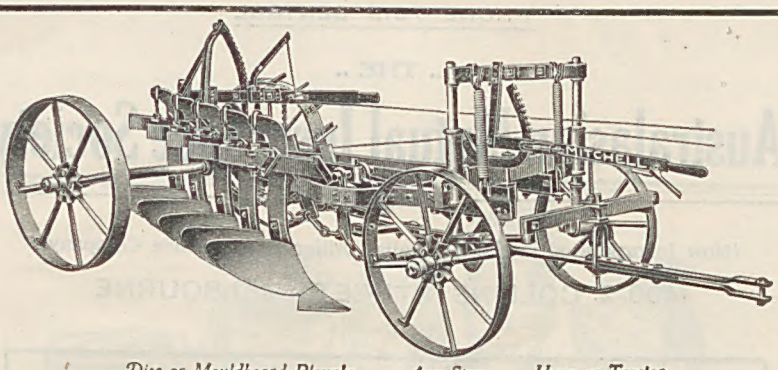

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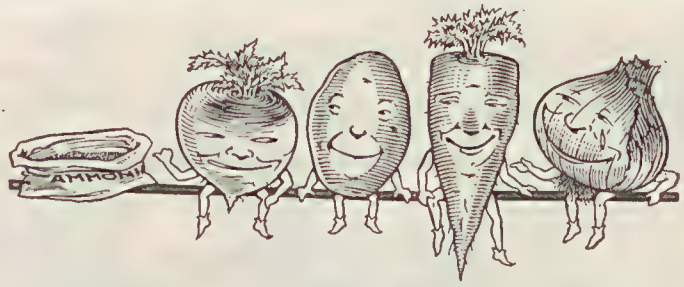

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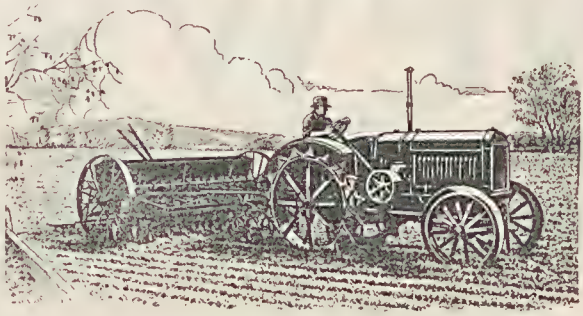

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CHEMISTRY IN AGRICULTURE.

W. R. Jewell, M.Sc., Agricultural Research Chemist.

THE CHEMICAL LABORATORY AND THE FARMER.

It is not generally realized how intimately chemistry is associated with the practice and principles of agriculture. At first glance, it might appear that, of all occupations, farming is the most self-contained and the least likely to be influenced by the application of chemistry and by the work of the chemist in his laboratory. Yet chemistry is closely bound up with almost every phase of agricultural practice, aiding in developing new and better processes and in explaining the results obtained from known processes. Probably no other science has done so much to advance and improve the whole system of agriculture.

In this article it is hoped to explain, in non-technical language, the important place which chemistry occupies in relation to agriculture, and to show that the farmer has a definite interest in, and connexion with, a chemical laboratory.

" The farmer tills the soil that plants may grow, that man may live. This," says Joseph Chamberlain, in an introduction to ' Chemistry in Agriculture ', " is a very simple statement, but one that leads to fascinating stories in its unfolding. Our bodies and those of other warm-blooded animals, are wonderful chemical laboratories in which most marvellous chemical reactions are constantly taking place, and so long as the body lives these reactions continue. But they can continue only as long as food and air are administered to the body. And what is our food? It is the product of another series of chemical reactions taking place in some plant or in the body of some animal which in turn has had its daily food. The plant too can live only as it has its food supplied to it, and the plant's food come from the soil, meaning thereby not only the plant food constituents in the soil, but also the water and air with which the plant is in contact. Further, when animal bodies die, the material which has thus come from the soil returns again to the soil, and a wonderful cycle of chemical changes is completed. These three then, the soil, plants and animals, form nature's great triad through which a continuous cycle of chemical change is going on.

"The farmer is nature's agent in promoting the continuity of this cycle, by cultivating the soil for the purpose of growing plants to serve as food for animals and for man. The art or science which he practises we call agriculture, and that part of the general science of chemistry which has to do with the knowledge, and the explanation of the chemical reactions involved in this cycle we may term, in its broadest sense, agricultural chemistry. If chemistry could answer all the questions arising from this cycle of changes, it would go far to supplying an answer to Tennyson when he wrote:—

> 'Flower in the crannied wall,
> I pluck you out of the crannies,
> I hold you here, root and all, in my hand,
> Little flower—but *if* I could understand
> What you are, root and all, and all in all,
> I should know what God and man is.'

"That answer may ever be beyond us, but chemistry has done much in the last century and a quarter to discover new facts as well as to explain many already known; to make the practices of agriculture more truly scientific and to provide the materials necessary for that scientific practice; to help the farmer to solve one of the greatest problems of all time, namely that of producing from the soil, through plants, the food for the human race. And although the problem is not wholly chemical, yet it is true that chemistry is one of the sciences on which must largely rest the responsibility for its solution."

The establishment of agricultural chemistry as a separate department of science dates back about one and a quarter centuries. This is a short span measured even by the length of our civilization, and yet the whole of that great mass of facts, which we include in the term agricultural chemistry, is the result of the labours of great investigators from the commencement of that period to our own time. Agricultural chemistry has its activities in laboratory, field, stall and factory, and in each of these spheres, investigation has raised the practice of agriculture to a scientific basis. Chemistry has been applied to the study of the soil, its composition, type, fertility, &c.; to the numerous plants that are grown, their composition, fertilizing requirements, improvement, and relations with the soil; to principles of animal nutrition and the establishment of a system of feeding based on scientific principles.

Apart from this investigational work, chemistry has directed its attentions to the factory and manufacturing side. The many discoveries and advancements in the fertilizer industry come readily to mind. By developments in chemical technology, new and profitable avenues have been opened up for the utilization of a wider range of products from the farm. By the solution and explanation of the various processes underlying the preparation of certain products and suggestions in economy of working, large and important industries have been assured an extended existence, and the by-products of manufacture utilized with profit. Tanning, brewing, wine-making, the manufacture of starch, concentrated feeding stuffs, dairy products, sugar, &c., are instances where chemistry has, either directly or indirectly, profoundly influenced the activity of a whole district, and sometimes of a whole country. A

beet sugar factory, for instance, is almost solely a chemical laboratory on a big scale. Every operation is really a glorified laboratory process, huge vacuum boilers replacing glass beakers and filter presses small filter papers. And the large areas devoted to sugar beet production in America and more recently in England, with the corresponding number of sugar factories, are a clear indication of the usefulness of this chemical process to the farming community.

Apart from fundamental research work and the manufacturing side, there is another aspect in which chemistry renders a direct service to the man on the land. I refer to the regulative or protective aspect, in which the products of the farm, and the products sold to the farmer are subjected to analytical control, and, where necessary, protective legislation has been framed and enforced. The purity of foods, feeding stuffs, fertilizers, insecticides, &c., are thus subject to regulation with the view, on one side, of preventing fraud being practised on the farmer in his purchases; and, on the other, with the object of preventing an indirect injury to farming industries by excluding inferior articles and produce from competition with the genuine product on both foreign and local markets.

Misrepresentation of goods is as old as history itself. Indeed one early historian recounts the incident of an adulterator of wines who was compelled to drink a large amount of his own product, with fatal results. Just as many other articles and products of utility from time immemorial have been made the vehicles of deception in connexion with their manufacture and sale, so have fertilizers, feeding stuffs and insecticides from time to time, been subject to adulteration or misbranding. This has necessitated the enactment of laws for the protection alike of the consumer and the honest manufacturer, and to ensure that products are kept up to uniform standards.

Just as the chemist has played an important part in the working out of formulae, the selection and proportioning of ingredients, the manufacture of the final product, and also in prescribing how and under what conditions some of these products are to be employed, so likewise, the chemist plays a most useful and essential role in the detection of violations of the laws protecting the consumer when purchasing these products.

In this State the farmer is protected by laws regulating the sale of fertilizers, insecticides and stock foods. The provisions of the Fertilizers and Stock Foods Acts have been fully explained previously, when it was emphasized that the Department was willing at all times to advise farmers in doubt on any point in connexion with the purchase of these commodities, and it was pointed out that it paid to be sure before buying. Cases of deception are fortunately very rare in this State, and the few cases of contravention of the law are due generally not to intentional fraud, but often to carelessness in manufacture, carried out frequently in the absence of effective chemical control.

These Acts serve another useful purpose in ensuring that certain products remain uniform, and that the purchaser knows exactly what he is buying. When, for instance, the large annual consumption of fertilizers is considered, the desirability of keeping this large tonnage up to standard will be fully recognized, in view of the fact that the increased value of the crop often amounts to several times the cost of the fertilizer applied.

Upon control chemists, not only devolves the task of analysing fertilizers, feeding stuffs and insecticides, but also of conducting a large share of the investigational work required in fixing standards and definitions for the several classes, and in deducing conclusions from the results of such investigations. Eternal vigilance is the price of liberty and of safety too, and in assuring the safety of the purchaser, the control chemist is, as it were, a sentinel on the watch tower, prepared and ready to warn the consumer when danger confronts him.

The foregoing remarks have given an outline of the general question of the influence of chemistry on agriculture, with the protecting-the-purchaser-attitude treated in somewhat more detail. Perhaps it would not be out of place here to give some little account of the laboratory at the Department of Agriculture, and of the work done there.

Not every farmer knows that the Department of Agriculture has a well-equipped and well-staffed chemical laboratory engaged in chemical investigations, in researches in conjunction with other branches of the Department, and in anlaysing samples of widely different nature, some from farmers, some of departmental origin, and some in connexion with the various acts operated by the laboratory. It will no doubt be news to many when they are told that this laboratory last year, in addition to investigational work, analysed some 3,300 samples involving 10,000 separate determinations. This does not include some 25,000 milk samples tested in connexion with standard herd testing. Many farmers have been helped by analyses of widely different materials submitted by them. The usefulness of having water samples analysed was stressed in a previous article (see this *Journal* for December, 1927). A nominal fee is charged for most of this work. It must be obvious that the farmer can often be assisted by having an analysis of feeding stuffs, gypsum, liming materials, soils, &c. It may help him to select the material most suitable and economical, or to get the best results from the various activities of his farm. And the Department is willing at all times to render him the assistance and advice it can.

CROPS AND SOIL.

In his studies and experiments with soils the agricultural chemist has done much to improve the practice of agriculture. Obviously the subject is far too broad to be dealt with adequately in a few pages, and all I can hope to do is to give an outline of some of the more general principles involved.

The ancient statements that "out of the dust of the earth was man created," and that he returns "earth to earth, ashes to ashes, dust to dust" are scientifically correct, for the ultimate source of the materials which compose the human body and the energy which keeps it going through life is the soil, transformed through the medium of farm crops into human food. The source of all human food is plants, manufactured by nature's processes exclusively from soil, air, sunshine and water, and it is only when one appreciates this fact that one realizes the vital importance to human welfare of the inter-relation of crops and soils.

Directly or indirectly, all human food comes from the soil through field plants as the transforming medium. This plant growth is either

eaten direct as in the case of fruit, or cooked or put through some process before consumption, or may be is first consumed by animals, which later are eaten by man. But in every instance human food comes into being first as a plant, which in turn has its origin in the soil, with sunshine, air and moisture as accessory factors in growth. So that there is little wonder that from the earliest times the problem of how plants transform the lifeless and inert mineral matter of the soil into living tissues has been a fascinating field for study. And although from the very earliest times field observations and practices were surprisingly in accord with modern knowledge and practice, agriculture in all nations and in all ages was on a constantly declining scale until the science of chemistry was developed, and an exact scientific knowledge of what are the principles of plant nutrition, and of soil exhaustion was evolved. Now it appears that there is at least a scientific possibility for a permanent agriculture.

It is one of the marvels of biology that from the same soil and moisture, plants can develop of entirely different form, colour, taste and smell. The mechanism by which different plants build up such widely varying forms out of the same simple compounds is not known, but analysis has shown that although the outward form may differ yet the chemical composition is fairly similar. They are all composed of certain amounts of definite chemical compounds, such as proteins, fats, celluloses, carbohydrates, with some mineral matter in addition. Different plants may have different proportions of those ingredients and some have special ingredients which give them some unique property, e.g., oil of garlic in onions, nicotine in tobacco, colouring matter in red beet roots, &c., but these special characteristic components are usually present in very small proportions.

In general, plants are made up chiefly of the general types of compounds mentioned, and different crops have similar requirements of mineral nutrients which they obtain from the soil. Crops must be able to obtain an adequate supply of each of a few simple mineral elements in order to make satisfactory growth and to reach complete maturity.

Chemical analyses of dried plants show that they contain usually from 90 to 98 per cent. of organic or combustible material, which they have themselves manufactured from gases in the atmosphere and from moisture received from the soil, and from 2 to 10 per cent. of ash or mineral matter derived from the soil.

Detailed analysis of this ash shows that it contains the mineral elements found in the soil on which the plant grew, but in very different proportions from those in which they occur in the soil. In other words, plants have a selective action in taking from the soil certain quantities of the mineral plant food elements which are offered to the plant roots for absorption. So that of the numerous mineral elements in a soil only a few are considered as essential for plant growth. Of these the most important are phosphorous, potassium, calcium, magnesium sulphur, iron and nitrogen. Nitrogen is not really of mineral origin as its ultimate source is the atmosphere. But higher order plants cannot assimilate atmospheric nitrogen, which must first be absorbed and utilized by lower micro-organisms. These " fix " nitrogen from the air and ultimately supply it in a form suitable for absorption by the rootlets of higher plants. Decaying or decayed vegetable matter, present in the soil is also a source of nitrogen to growing plants.

The so-called essential elements of plant food which crops obtain from the soil are necessary to all crops, because each of them is used in some definite way by plants in building up the compounds of which their tissues are composed. Briefly these essential functions may be said to be as follows:—

Nitrogen is a constituent element of all proteins which are the all important ingredient of the active material in every living cell. Protein materials are finally stored up in the seeds, but during the growing period they are actively at work in the foliage of the plant. Hence the popular statement that "nitrogen makes foliage," is a fairly accurate expression of its function in crop growth. Nitrogen starvation produces noticeable changes in the growth of any particular crop. The leaves are stunted in growth, yellowish instead of dark green in colour, and the whole crop has a stunted or starved appearance. Abundance of available nitrogen on the other hand gives a rank growth of rich deep green colour.

Phosphorus is also an extremely important element in plant nutrition. Its exact function is not definitely known. It is a constituent of most proteins and seems to have some definite relation to cell division and multiplication in growth. Phosphorus starvation does not show so markedly in the outward appearance of the plants as does lack of nitrogen. Abundance of phosphorus, especially in the early stages of plant growth, stimulates root development rather than foliage growth, which helps to explain the beneficial effect of comparatively minute applications of super in wheat cultivation. Later in growth, phosphorus apparently hastens the ripening process. So that phosphorus may be said to be the balance to nitrogen in crop growth.

Potassium is undoubtedly the third great essential for plant growth and the general tone, and vigour of the plant are largely dependent upon an ample supply of this element. It is in some way connected with the manufacture of sugars or carbohydrates in plant cells. Potash-hungry plants do not exhibit any characteristic external change in form or colour, but their vigour is much reduced and they are more susceptible to injury by disease than are well nourished normal plants.

Calcium (or lime) is an essential element of plant nutrition, and seems to have some connexion with the formation of woody fibre or cell-wall material. It must have some other use, especially in certain "lime-loving plants," which use relatively large proportions of lime in their tissues.

Other elements also have each their specific functions to perform in promoting plant growth; but since they are required in smaller amounts than are the four just mentioned, and are usually present in soils in ample amounts for all crop production requirements, they are not usually regarded as of such critical importance in agricultural practice as are the others. Magnesium and iron are in some way associated with the formation of chlorophyll, the green colouring matter of all high order plants: since chlorophyll is the agent by which the radiant energy of the sun is absorbed, and so determines the rate and amount of actual manufacture of chemical compounds which can go on in the plant cells, its importance is readily recognized.

Recent investigations have shown that small traces of other elements are essential to plant growth, not so much as a source of nourishment as an impetus or stimulant to growth. Boron is such an element. Probably

few farmers have heard of this material, although it is present in practically all soils. Some plants can live happily without it while others prefer to starve rather than take their food without a flavouring of boron. This fastidious group includes beans, lucerne and several of the clovers. Without boron these plants struggle for a short time, but soon begin to die. Flower buds fail to develop and fall off, the stem blackens, growing points wither, and finally all growth ceases. No other element has so far been found which will tempt them to eat and live; they must have boron or perish. Manganese is another element which must be present if some plants are to grow successfully, and the study of these and other elements indicate that almost infinitesimal traces of certain elements play an important part in plant growth.

Generally speaking all but three, namely, nitrogen, phosphorus and potassium, of these essential elements are present in nearly all soils in ample amounts for the needs of all farm crops. These three, however, often become deficient, either because of a limited original supply in the soil, or through constant cropping without adequate application of fertilizers.

The foregoing briefly indicates the needs of the crop and its relation with soil, and now, in conclusion, I shall briefly consider how the soil supplies these needs. The expression "in available form," is used in discussing the utilization of soil element by plants, and a knowledge of what is involved in the term "availability" is necessary to understand this utilization.

An analysis of any soil will show that it contains hundreds of times the quantity of each of the various essential plant food constituents that is necessary to produce a maximum yield of any of the common farm crops. Most of this is not soluble in water, but to be available to plants the soil elements must become soluble, as the only way plant food can enter the plant is through the medium of the fine membranes which are the outer walls of root hairs, and to do this the elements must be in solution. Thus only the soluble forms of potassium, phosphorus, &c., are available as plant foods, and the whole problem of soil productivity, from the stand-point of plant food supply, depends on the presence in the soil during the growing period of a sufficient amount of each of the essential elements in soluble, or available form. These are rendered available by weathering processes, by the action of acids produced from decaying vegetable matters, and by the action of soil micro-organisms; and these actions are continually proceeding and gradually rendering soluble the complex constituents of the soil.

Where, either through adverse conditions or through over-cropping, insufficient plant food is not available in the soil, soluble plant foods in the form of commercial fertilizers must be added to ensure maximum production, which brings me to a convenient point at which to conclude.

CARE OF EWES AT LAMBING-TIME.

By N. A. Bowman, Sheep and Wool Expert.

The commencement of the lambing season brings onerous tasks to most sheep-breeders. The station-owner, with his stud flocks, spares no effort to secure the maximum results when valuable sheep are at stake. Those who farm on a smaller scale must also recognize their responsibility in this direction; every lamb saved will become an asset to the State, and farmers who in the past have followed haphazard methods should take a more serious view of the duties that lambing-time brings. In this article attention is directed to the work of handling breeding ewes during this critical period in the development of the flocks of the Commonwealth.

Correct Way.

Incorrect Way.

Crutching Sheep.

[Reproduced from *Farmers' Bulletin* No. 95 of New South Wales Department of Agriculture.]

Crutching.

One of the essentials necessary for increasing the percentage of lambs that will be reared is a more general practice of what is known as "crutching."

The breeding ewes should be crutched some three weeks or so before they commence to lamb. In handling them, great care should be exercised so as to lessen any danger of mishaps. When taking the ewe from the catching pen, she should on no account be carried by her fore-end; such action may cause her to lose her lamb. She should be led out of the catching pen, and, when placed on the crutching board, turned up very carefully. Much time and energy are wasted by handling sheep roughly. To turn a sheep up carefully and conveniently, place the left arm under the jaw and catch hold of the right cheek; then turn the head to the left and upwards; at the same time pass the right hand over the sheep and take hold of the left hind leg and pull it with a forward motion towards the centre of the belly, and the sheep will fall gently on her rump and in just the right position to be crutched.

To do the work properly the whole of the crutch up around the tail head under the hind legs should be shorn. In some cases I have heard sheep farmers say that, where the country is carrying burr to any large extent, they find it pays to clean up in front of the thighs, also in front of the udder, so as to ensure that the lamb will have no difficulty in finding the teats.

Careful handling cannot be over-stressed. There should be no sudden drop into the shorn-sheep-pens, and to prevent crushing, the ewes should be counted out when the pen is little more than half full.

Lambing Paddocks Desirable.

Ewes should not be excessively fat at lambing time; good strong store condition is the best. Where possible, special paddocks should have been spelled in order to furnish fresh clean pasture for the lambing ewes. On large station properties, where there are capable married men living on the run, it is the practice to reserve paddocks near their houses for the ewes. This enables the men to give them closer attention at the most critical time. It is advisable for one to go among them as much as possible just before lambing time in order to get them well accustomed to being rounded up and handled. They soon become quite used to the presence of the man who is looking after them, and will neither run away nor show any alarm at his approach. Only well broken, silent, and wide-working dogs should be allowed among the ewes. As sheep are, perhaps, the most nervous of all domestic animals, it is a great advantage to have them quite before lambing, so that, in the event of any requiring special treatment, they are less likely to suffer from nervous shock. It is of the utmost importance that the ewes, during this period, should be healthy. To ensure this a good supply of salt or a lick should be available to them.

In districts where foxes are prevalent it is a good plan to put strychnine on the bodies of lambs that have been killed—just sufficient to cover a sixpence is the usual dose. Sparrows, starlings, and parrots are also good bait. Of course, it must be remembered that, by poisoning dead lambs, &c., it is quite possible to catch innocent dogs—and others.

Care at Lambing Time.

The man whose task it is to look after the ewes should be out at daybreak, and look first to the sheep camp for any ewes which may be in difficulties. Sometimes a ewe that is extra timid may desert her lamb. Should one show signs of doing this, she ought to be tied down and the lamb laid at her head. It will not be very long before the mother will take kindly to her offspring, and she may then be let loose. Another good plan to meet such circumstances is to make a small yard with three hurdles, and place the ewe and the lamb therein: this method is especially suitable for smaller holdings.

Full attention must be given to each and every flock daily. Early morning and late evening are the best times to be among the ewes and lambs. In the case of ewes that have not previously had a lamb, one should make it a practice to be among them three, or, perhaps, four times a day.

One of the slogans of the Better Farming Train is—"When ewes are lambing it will pay to give them attention twice a day," but while

receiving such attention they should be disturbed as little as possible. If they are watched by the same man every day, and if he rides the same horse when going amongst them, they will soon cease to be alarmed at his approach.

As a rule few complications arise during lambing, and one should be sure his services are necessary before interfering with the ewe.

Feeding Ewes.

The question of feeding breeding ewes in order to keep the lamb growing is one of great importance. Of course all breeders will not see eye to eye on this question. Some will raise objections such as that of cost, since, once the feeding of ewes is started, it has to be kept on until the grass comes away. Under present conditions discussion as to the provision of food may seem out of place, but in a normal year this certainly becomes a very important question. Mr. Richardson, of Goorin, Dobies, Victoria, gives serious attention to feeding his good ewes prior to lambing. He uses a self-feeder—details of which were published in this *Journal* for November, 1927. A photograph of the feeder is reproduced below.

Self-Feeder used for Sheep at Gorrinn, Dobies, Victoria.
(The posts and battens are to prevent the feeder blowing over in strong winds.)

The Crossbred ewe is a heavier milker than the Merino, and, therefore, requires a more juicy food. That is necessary for milk production, and milk is essential for a vigorous lamb. At the same time as she is rearing her lamb the ewe is expected to grow a good fleece of wool, and if feed be scanty and short, not only will the lamb get a setback, but the mother's fleece also will suffer.

In feeding tests conducted at the Werribee Research Farm ensilage was found to be the best fodder. A pamphlet containing records of these feeding tests, &c., can be obtained on application to the Department of Agriculture, Melbourne.

The mention of silage at once brings to the fore the question of conservation of surplus fodder against the time of drought. This subject has been preached in season and out of season for years, but with

little apparent effect. There is, however, not the slightest doubt that, by cutting and storing—in the form of silage—surplus grass and herbage in flush seasons, losses due to drought may be minimized materially. Ensilage properly made is cheap, and, with the addition of some grain and salt, is almost, if not quite, equal to natural grass and herbage in maintaining sheep in health and vigour.

Hand Feeding Lambs.

When twins are born there is a liability of the mother losing sight of one of them. In a case of this sort the lamb can be saved by hand feeding. Young lambs can be reared in many different ways—some good and others bad. When lambs are first brought in they should each receive a very little cow's milk, to which warm water and also about half a small teaspoonful of castor oil has been added. For a few days they should be fed four or five times a day with milk and warm water, only two good tablespoonfuls being given at a time. Later three or four drinks daily will prove sufficient until such times as they are quite big and strong.

Young lambs suffer from cold, and should be kept warm at night.

The Marking of Lambs.

When the time arrives for marking and tailing, temporary yards made with stakes, wire netting and a few hurdles, should be erected alongside a fence in the paddock where the lambs and ewes are gathered for the purpose of marking. Great care should be taken to prevent rushing the lambs; it is very desirable that they should not be overheated. Where temporary yards are used it will lessen the risk of any deaths from tetanus or blood poisoning, which frequently supervenes if the operation be carried out in filthy yards. If the sheep-yards are used, they should be quite clean. It is a wise precaution to disinfect them with some sheep-dip or other antiseptic.

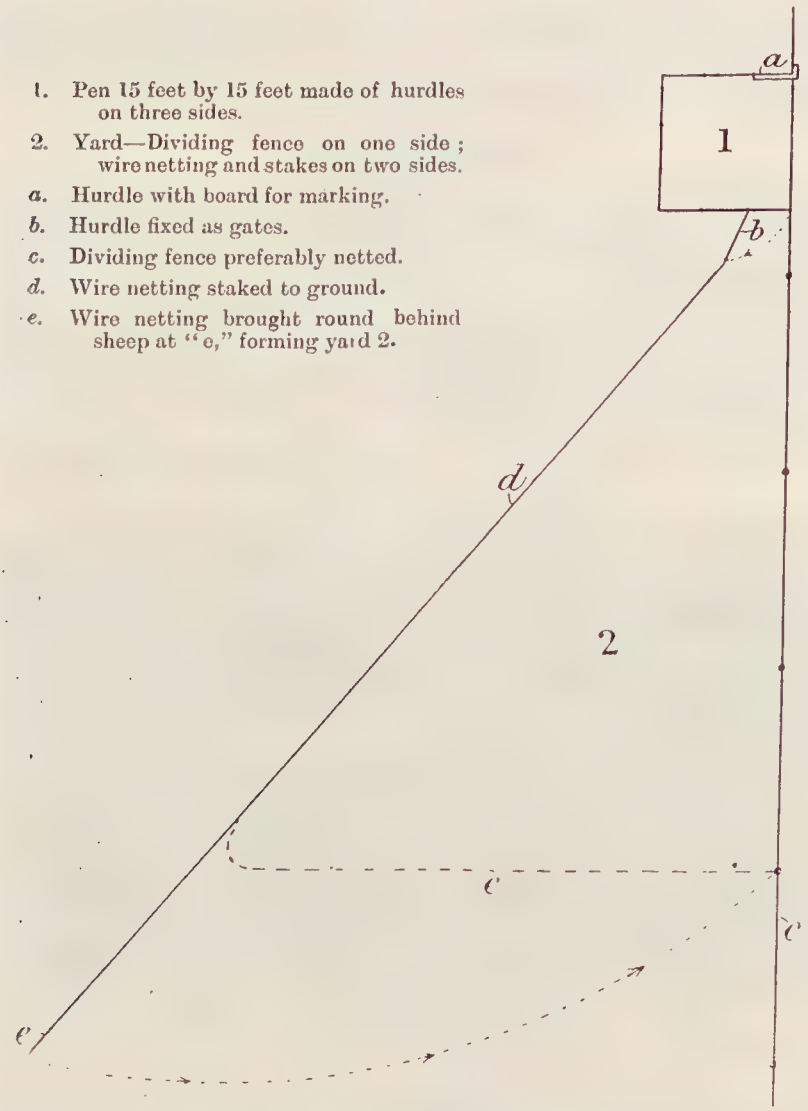
All knives and pliers required should be thoroughly cleaned and disinfected before marking is commenced, and frequently while they are being used, say, in a solution of one part carbolic acid to twenty parts of water. The catcher should rest the lamb on its hip bones on the top rail with its shoulders against either of his; he should catch the hind legs over the hocks and draw them forward between the lamb's forelegs and its brisket, and hold them there. The catcher generally calls the sex and presents the ear for marking, but the marker should verify the sex before he, with his pliers, snips the ear-mark in the left for males and in the right for females. Generally speaking the tail is cut off at the second joint below the tail-head. Before it is actually cut the skin should be retracted slightly towards the lamb's body by the man holding the lamb. Then when the lamb is released the skin will overlap the end of the bone, and protect the flesh while healing is taking place.

The operator should throw the tails into two heaps as he cuts them off, males on one side, ewes to the other, so that an accurate count can be got of the number of each sex when the flock has been dealt with.

If the process of marking be carried out in a clean manner and the lambs placed on clean pasture after the operation, dressings are not necessary; as a matter of fact sticky dressings do more harm than good.

1. Pen 15 feet by 15 feet made of hurdles on three sides.
2. Yard—Dividing fence on one side; wire netting and stakes on two sides.

a. Hurdle with board for marking.
b. Hurdle fixed as gates.
c. Dividing fence preferably netted.
d. Wire netting staked to ground.
e. Wire netting brought round behind sheep at "e," forming yard 2.



Temporary Yard for Marking Lambs.
(Will hold 250 ewes and their lambs—scale, 1 inch equals 21 feet.)

DEPARTMENT IS ANXIOUS TO HELP THE SHEEP FARMER.

Farmers requiring information regarding sheep and wool, or desiring help in culling, classing, or selecting sheep, are reminded that the Department of Agriculture is anxious to help them. All correspondence should be addressed to the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne.

TOP-DRESSING LUCERNE.

By L. C. Bartels, B.Ag.Sc., Senior Irrigation Officer.

The best evidence of the value of top-dressing lucerne is furnished by the wonderful extension of the practice which has taken place in the last few years—one might say, in the last three or four years.

Guided by the results of experiments in the different irrigation districts, the Department of Agricultuure has vigorously advocated the manuring of lucerne. The farmers who have tried it have in turn become advocates, until now very few if any growers dispute the wisdom of top-dressing their lucerne stands.

Lucerne is a very productive fodder plant under irrigation; the farmer may expect at least five cuts during the growing season besides some winter grazing. On many farms lucerne is grazed throughout the year, but whether the crop is cut or grazed, the draught on the stores of available plant food in the soil is very great.

Lucerne is a deep-rooting plant and is able to draw on the soil to greater depth than most fodder crops; but only on the richest soils is the vigor of a lucerne stand maintained without manure; in fact, on most soils it never reaches full productivity until manure is applied. It indicates shallow reasoning to say that the droppings of stock depastured on lucerne provide sufficient manure; yet that argument has been seriously made to me. I have been told that sheep manure the ground sufficiently; but one might ask—What of the mineral matter in their carcasses? Whence has that been derived? Likewise one must consider the mineral elements removed in lucerne hay and in milk.

The Value of Superphosphate as a Fertilizer.

On such lines, one may reason that top-dressing should be good. It is, however, not a matter of speculation, for the results obtained on experimental plots and on numerous private farms have absolutely proved its value. The advice given by the Department to irrigation farmers growing lucerne is:—Top-dress liberally with superphosphate; a liberal dressing is from 2 cwt. to 4 cwt. per acre per annum.

Superphosphate supplies phosphoric acid in a form in which it is readily available to the plant, and is the most efficacious of the phosphate manures. The rock phosphate from which it is made is relatively insoluble, and even under irrigation it is of little benefit. In the manufacture of superphosphate this rock phosphate is acted upon by sulphuric acid. The grade of super. in general use contains the equivalent of 22 per cent. of phosphoric acid. Bone fertilizer, like the ground phosphate rock, contains phosphoric acid, locked up in a tight chemical combination. In experimental tests it has failed to give results comparable with those obtained from super. in top-dressing lucerne. Superphosphate was first made from bones, a fact which suggests that the need for a more effective fertilizer than bone manure was always recognized. Bone fertilizer is dearer than superphosphate. It contains some nitrogen—a valuable manurial element—but if lucerne is grown under suitable soil conditions it is independent of outside supplies of nitrogen. The nodules which form on the roots contain colonies of nitrifying bacteria which are able to fix the nitrogen of the

air as nitrates, and in this form the nitrogen is assimilated by the lucerne plant. For that reason nitrogenous manures are not generally used.

Basic slag—another phosphatic manure—is a by-product in the manufacture of steel. Although used to some extent a few years ago, very little is used in Victoria now. One reason was that the continuity of supply was interrupted by the war; while, again, a change in the methods of steel making has resulted in a slag poorer in phosphorous.

The stopping of supplies of basic slag (or Thomas' phosphate or Star phosphate, by which names it was known), led to the production of basic phosphate, which is super. mixed with a proportion of lime.

Lucerne is a lime-lover, and a high percentage of lime enters into its composition; in fact, the plant will not grow at all if lime be lacking in the soil On the other hand, dressings of 1 ton of lime per acre have not given very striking results in the northern irrigation districts. Sulphate of potash has been tried, but without conclusive evidence to indicate its value.

What does emerge from all the tests is that phosphatic manure is the main requirement in lucerne top-dressing, and super. is the most economical form to use.

The Value of Gypsum.

Dressings of gypsum have been tested in all the series of plots. As a supplement to super. it has given some increases, but not such increases as have been derived by the application of additional super. The influence of gypsum and lime in modifying the character of tight soils varies with the composition of the soils, but it would seem that their profitable use in the irrigation districts is determined by the nearness of supplies. For the Swan Hill flats gypsum is obtained from the near-by deposits at Woorinen. It has a marked influence on the black soils of the flats. When gypsum is applied heavily, these soils become looser, and the tendency to crack is reduced. Farmers should have a clearer understanding of the relative qualities of super., gypsum, and lime. One farmer I know is reported to have said—"I have tried super. as advised, and it was useless; now I am going to try gypsum." Gypsum is of no use as an alternative to super. for the purpose of supplying phosphatic manure to the soil. In fact, with lime, it falls into a different category, and is not to be regarded as a source of plant food. The calcium and sulphur in its composition are certainly plant foods, but under our conditions sulphur does not appear to be an element which is a limiting factor in plant production, and in any case, is contained in superphosphate in sufficient quantities to supply all requirements.

Gypsum and lime are soil amendments. (Gypsum will not sweeten a sour soil. It will modify the deleterious influence of some forms of salt). By all means try them if they are cheaply available, but remember that neither of them makes good the prevailing deficiency of phosphoric acid.

Results in Experimental Plots.

The tests at the Werribee Research Farm have been the basis for the departmental teaching. The usual practice on the farm is to apply 2 cwt. of super. per acre annually. Experiments have shown

that the application of 4 cwt. per acre is payable, and many farmers on the Werribee settlement use that quantity applied in one or two dressings each year. It is from tests in the outside districts that the most conclusive evidence has been forthcoming. In 1924, plots were laid out on the farm of Mr. Masters on the Murray River flats at Swan Hill. In the same year tests were instituted at Rochester. Since then similar tests have been started at Tongala, Stanhope, and Cohuna. The results from all are in accord; they demonstrate the value of top-dressing and the efficiency of superphosphate, and in those results we have our warrant for emphasizing the benefits of using it.

At Swan Hill the quantities of super. applied to the plots compared range from 2 cwt. to 6 cwt. per acre. Super. and lime and super. and gypsum in combination are being tried, and rock phosphate and bone fertilizer are also included. In the other centres quantities of from 1 cwt. to 4 cwt. of super. per acre have been tried, as well as the other manures. In some of the plots the value of potash is being tested.

The most spectacular results were obtained at Swan Hill, but the present appearance of the Tongala plots is convincing evidence of the value of top-dressing; and the same story was to be learned from the Rochester and Stanhope plots. When the Swan Hill plots were started doubts were expressed by some settlers as to whether manure would be effective—it was unreasonable to suggest that rich river flat land needed manure; good crops had formerly been grown without it, and its use would be to lower the quality of the land on the flats. The results a few weeks after application left no room for doubt, and these results have been maintained over four seasons. The plots treated with super. stand far above the untreated plots.

The stand of lucerne was over five years old when the tests were initiated, and the lucerne on the manured plots has been rejuvenated. The heavily manured plot, which gets 6 cwt. of super. per acre, gives three times the yield of the unmanured plot adjoining. Last year it produced nearly as much in one cut as the unmanured plot did for the whole season.

The Time to Top-dress.

Regarding the time of application the general practice is to put the manure on in July and August when the lucerne is awakening to new life. The unmanured plots show to greatest disadvantage in the autumn, and some farmers apply manure then in a second dressing to invigorate the plants for the winter period. When sufficient manure is given—say, 4 cwt. per acre—it does not seem to matter much whether it is given in one dressing or two. Some farmers, if for any reason they have not been able to manure their lucerne stands before about the end of August, will omit the work altogether. This is a mistake. The proverb "Better late than never" can be applied to top-dressing, and it is a mistake to defer manuring when a stand is obviously in need, even though spring is past.

The method of application varies. The drill is commonly used, but the one-horse manure spreader has been found very good. Other forms of spreaders are attached to a dray and the manure falling from a hopper on rapidly revolving vanes is flung broadcast. The farmer who applies manure by hand will not have an agreeable job, but results will be quite effective. Rains will fix the manure in the soil, and there is very little washing away of super. with irrigation water.

Profits from Top-dressing.

One no longer encounters much opposition when advising the top-dressing of lucerne. The results from the tests are too marked, but "wait and see" say some of the "die-hards"; "you cannot add artificial manure year after year without seriously affecting the soil." Others say that super. is only a stimulant. If these arguments were well founded one should find support for them on the Swan Hill plots, where 6 cwt. of super. has been applied every year for four years. Surely the evils of the practice, if there were any, would be apparent now. As a matter of fact, the yield from the heavily manured plots is the best in the series, while that from the no-manure plot adjoining is the worst. Of course, one may at times hear this complaint, "I have manured my lucerne, but cannot get the results claimed for it." No doubt at times the results are disappointing, but probably the reason has been a lack of moisture, for unless lucerne is given sufficient moisture it cannot make vigorous growth. Sometimes the results are progressive. As the roots go deeper, the permeability of the soil to moisture is improved, and the plants make better growth. This has been noticed at Tongala, where the yields are getting better every year; last season an application of 4 cwt. of super. doubled the yield. Perhaps the best way to demonstrate the value of manure is to give some details of the net profits accruing from its use. These have been worked out from the results of the test plots; they are on a conservative basis, the hay being valued at only £2 10s. a ton. The average of four years' yields from the Swan Hill plots shows the following yearly profits over the unmanured plot:—2 cwt. super., £4 13s. 6d. per acre; 4 cwt. super., £7 15s. 9d. per acre; 6 cwt. super., £11 13s. per acre. Three years' results from Tongala show the following profits per annum:—2 cwt. super., £2 5s. 6d. per acre; 4 cwt. super., £4 3s. per acre. The value of the extra winter grazing is not assessed, nor is the extra feeding value of the lucerne. The prolonged life of the lucerne represents a reduction in farm maintenance costs.

I have mentioned that at Tongala the yield of lucerne has been doubled, and at Swan Hill it has been actually trebled. There is no "catch" in these statements, and no guesswork in the claims made. The different plots are open for inspection. Their yields have been weighed and recorded, and what is of more significance, other settlers who have adopted top-dressing have been able to obtain equally good results. It should be recognized that one need not double yields to double profits, and that the cost of establishing and watering and harvesting a poor stand of lucerne is as great as for a good stand, for there is the same work involved in watering and cutting. The added life of the stand must also be reckoned.

Superphosphate Helps to Combat Weed Growth.

The influence of super. in combating weed growth has been very well demonstrated on the plots. At Swan Hill the plots were very weedy when the tests were commenced. Umbrella grass was thick, but it has been practically eliminated from the manured plots. The unmanured plots are worse than ever. In the Goulburn Valley plots, weeds like Couch grass and *Paspalum distichum* have spread on the no-manure plots, but are arrested on the edge of the heavily "supered"

plots. Every one knows how aggressive these two grasses are. Super. leads to the more economical use of soil water by the lucerne, and it actually saves water, as the cover the improved growth gives reduces dissipation by evaporation. Sometimes a settler will say: "I have not been able to cultivate my lucerne, and therefore I have not top-dressed. The manure will be quite effective without the cultivation."

Conclusion.

In concluding, let me repeat some of the benefits of top-dressing with super.:—

Super. will increase the yield of lucerne.
It will rejuventate old stands.
It will enable the lucerne to smother the undergrowth of weeds.
It will enhance the feeding value of the hay, and will improve the health of stock.
It will extend the growing period of the lucerne, making feed available in late autumn and winter when most valuable.
It will prolong the life of the lucerne.

It has been conclusively demonstrated that these several benefits will follow top-dressing.

A CANADIAN GRAIN ELEVATOR.

The Canadian Government Information Bureau states that work has begun on the construction of a 6,900,000 bushel capacity grain elevator at Port Arthur for the Saskatchewan Wheat Pool, which will be the most modern and the fastest operating terminal elevator in North America. It will be ready for operation about 15th October, 1928. When completed it will be served by both the Canadian National and Canadian Pacific Railways, and will be able to receive as many as 500 cars of grain per day during the rush season. It will have a capacity of 300 cars per day of ten hours, and will be able to ship out grain at the rate of 150,000 bushels per hour.

The total length of the new elevator known as Terminal No. 7 will be 1,344 feet and the width 226 feet. The elevator trackage will provide space for 225 loaded cars to be spotted at one time, ready for dumping by the five automatic car dumpers, each of which will completely unload a car of grain in ten minutes on the average. To take care of this immense volume of grain, 28 elevator legs will be required to take the grain to the top of the elevator, from whence it is dumped into the scale garners.

The completion of this terminal elevator will give the Saskatchewan Wheat Pool a total capacity of 22,975,000 bushels at the head of the Great Lakes which, together with a 2,000,000 bushel terminal elevator at Buffalo and the space provided by the pool country elevator system in Saskatchewan, will give a total grain storage capacity of more than 50,000,000 bushels for the 1928-29 crop year.

SUCCESSFUL DAIRYING IN SOUTH GIPPSLAND.

By F. Fincher, Dairy Supervisor.

Dairying on progressive lines is being successfully carried out by Messrs. Pinkerton Bros., two returned soldiers, on their dairy farm at Kongwak, South Gippsland, and the result of their efforts is an example of what can be accomplished by wise management, careful breeding and generous feeding. The area of the farm is 136 acres, about 65 acres of which is rich flat country, with a frontage to the Foster River; the remainder of the property is of a hilly nature. The soil on the flat is a heavy grey, and carries a dense growth of rye and meadow grass, fox-tail and clovers; the clovers are white Dutch, Alsyke and strawberry, all of which have been sown with good results. The property is subdivided into several paddocks, and the owners state that this is a big factor in their success.

Some of the Dairy Cows.

The Growing of Fodder Crops.

Messrs. Pinkerton Bros. fully realize that the best results can be obtained from their dairy herd only by a practice of systematic feeding, and ample provision is made for the cows in this direction. The cows are hand-fed in the bails when the pastures become short. Cow-grass, oaten hay, maize, mangels and pumpkins are grown for feeding, and cultivation methods are thorough.

For mangels the land is always ploughed at least twice—three times if possible—and worked down very fine; a coat of yard manure is given, and the seed is drilled in with about 1½ cwt. of artificial manure to the acre. The young plants are horse-hoed and hand-hoed a couple of times.

For pumpkins the ground is worked down well; furrows 12 feet apart are made with the plough, one furrow being turned each way

outward, leaving a good wide trench; the trench is filled with cow-yard manure and the two furrows are turned back on each side with the plough, so as to cover the manure. Seeds are planted at intervals of 2 feet. When the plants are well up and about to throw out vines they are hand-hoed, and the space between the rows is ploughed and scarified. This checks all weeds and leaves the ground clean.

Maize is planted in drills with a maize planter; about 1¼ cwt. of manure is allowed to the acre, and the land is scarified as many times as possible.

The pumpkins and mangels are pulped and fed with chaff to the cows.

The area sown for these fodders is approximately:—Maize, 9 acres; mangels, 2¼ acres; and pumpkins, 1¼ acres. In addition, 7 acres of cow grass was sown about three years ago; this is now well established, yielding close on 2 tons of fodder to the acre. The plot was top-dressed with 1½ cwt. of superphosphates to the acre.

Looking Across to Cow-grass Plot.

The Dairy Herd.

The dairy herd consists of pure-bred and grade Ayrshire cows, and their sleek well-fed condition reflects the generous treatment given them. There are about seventeen stud-book cows and heifers on the property, ten of which are at present in the Standard Herd Test. It is the hope of these progressive settlers that ere long they will possess a pure-bred herd. The grade cows are also entered in the local Herd Testing Association and 39 cows, during the season 1926-27, averaged 247 lb. butter-fat per cow. The total returns from 39 cows, including eleven two-year-old heifers, was £721 for the season. As so much fodder is grown on the property, the cost of feed purchased is not high; the amount expended last year was £75.

An Excellent Milking Shed.

The milking shed which is built of hardwood and galvanized iron is of a rather unusual design, octagonal in shape, with a circumference of 198 feet, and is compact and convenient. There were originally 32 bails in the building, but portion has been converted into a feed-room,

A Pumpkin Patch.

The Cow-Shed.

and 28 bails are now in use. In the centre of the building is an iron silo of 200 tons capacity; it is sunk 5 feet below the ground surface and reaches to the roof of the shed—about 30 feet in all. There is also a loft in the shed capable of holding about 40 tons of

hay; the flooring of the loft is of tongued and grooved softwood, with no possibility of any dust falling through to the bails below. A space of about 4 feet from the walls of the silo to the feed bins in front of the bails gives ample room for feeding purposes. The floor of the shed is of brick, with drainage at the rear of bails. Four doors give access to the shed, and light is provided for by windows at intervals round the walls. Ventilation is from below; a space of about 1 foot being left between the ground surface and the bottom plate of the shed. The building, which was erected by Messrs. Halford Bros., former owners of the property, was designed with a view to being as convenient as possible.

Pigs—A Sideline.

Pigs increase the yearly revenue considerably, as many as 100 head —porkers and baconers—being sent to the Dandenong Bacon Factory during the year. Six breeding sows (Berkshire) and a boar (Tamworth) are kept. The principal ration is separated milk, pollard and barley; the grain is generally boiled, but tests are to be made as to the merits of this system as against dry feeding. Peas are added to the feed when topping-off the baconers. About 4 acres are sown for this purpose at the rate of 2 bushels per acre. The crop is sown broadcast during September or October with a small quantity of superphosphate.

CULTIVATION OF FARM PLANTATIONS.

A plantation should be cultivated for the first year or two in order to keep down weeds and conserve soil moisture. Cultivation should be continued until the canopy of overhead leaves is fully established. Any plants which fail to survive the planting operations should be immediately replaced. It is a bad policy to allow any replanting to be put off for too long a time, as the difference in growth tends towards the suppression of the smaller plants. Replanting, at all events, is rarely successful after the first year.

On very rich soils where weed growth is particularly vigorous, the "cut and mulch" system is sometimes adopted. The weeds are cut down with a scythe and allowed to lie around the planted trees. The covering of dead weeds helps to suppress further weed growth, and acts as a surface mulch. In some plantations, particularly those of conifers, there is a considerable risk of damage by fire. Where such is the case, a break should be cleared round the area and every care taken to prevent fires starting during the dangerous season.

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PARASITES IN PIGS.

By R. J. de C. Talbot, B.V.Sc., Veterinary Officer.

Pigs, like all other animals, suffer from many parasitic diseases; in fact, one might go so far as to say that there are few herds of pigs in the State in which some animals are not showing the effects of parasitism. Although this infestation of parasites is not so noticeable in its results as is the case in an outbreak of a contagious disease like swine fever, nevertheless it is of great importance, and the losses to the pig industry attributable to parasitic infestation must reach a very large figure every year.

This loss is all the more regrettable when it is realized that the treatment of affected pigs is comparatively easy and certain, and that prevention is possible if the pig-breeder is prepared to observe a few simple rules in regard to what might be termed swine sanitation, but unfortunately there seems to be a popular belief that a pig is only happy and contented when it lives under the most appalling conditions of filth and is fed on dirty food. In an environment such as this, it is practically impossible to raise healthy animals. Such conditions greatly favour parasites, for dirty food and sties always contain active sources for infection with pasasitic eggs.

Though owners are prepared to accept the drastic measures necessary to eradicate an outbreak of a disease like swine fever, many of them are slow to adopt the more or less simple measures which will effectively prevent their pigs from becoming affected with parasites.

In America this worm infestation of pigs is considered of such importance to the pig industry that in some of the States special railway cars are sent touring throughout the country, staffed with experts whose duty it is, by means of lectures and demonstrations, to impress upon the pig-breeder the necessity of keeping his pigs free from worms—that is, if he wishes to make pig-breeding profitable. The symptoms of parasitic infestation in pigs are, briefly, poor condition, slow growth, debility, weakness, sometimes diarrhoea and vomiting, in certain stages coughing, and occasionally a partial paralysis of the hind legs.

Pigs are liable to be affected with many different kinds of parasites, both external and internal, but in a short article it is impossible to deal with them all. I, therefore, propose to deal only with two of the most common, and so most important. These are the large round worm and the whip worm, both of which are found in the intestines.

Before any preventative or curative measures can be adopted, it is first of all essential that one should know something of the worms themselves, their life history, and by life history is meant the various stages they pass through, and also the place where they are generally found in the body.

As the two worms which it is proposed to deal with are different in all these respects, it will be necessary to discuss them separately.

The Large Round Worm.

The large round worm is the most common parasite found in pigs in this State, and there are few pig-breeders who are not familiar with its appearance. As its name indicates, it is a large round worm

frequently attaining a length of ten (10) to twelve (12) inches; it tapers at each end, and in colour it varies from yellow to greyish white.

This worm normally lives in the small intestine near the stomach, but frequently it wanders into other parts of the digestive tract and may sometimes be found in the stomach. In a severe infestation they may be present in very large numbers, several hundreds being sometimes found. Pigs of all ages are liable to be infested, but, like all other parasites, this worm more commonly affects young animals, on whom, as is to be expected, their effect is most injurious and, in many cases, fatal.

The life history of this worm is very remarkable, and the various changes it goes through are particularly interesting.

The female lays the eggs in the intestines in large numbers, upwards of thousands a day; they are very small and cannot be seen by the naked eye, but are visible under the low power of a microscope. No development of these eggs can take place in the intestine; it is first necessary for them to spend a certain time outside the body. After being passed out by the pig, if conditions are favorable (and by this is meant the presence of air, warmth, and moisture), a small embryo develops within the egg. This takes about two or three weeks, and the eggs are then infective is swallowed by a pig.

It is important to remember that the eggs may remain active and therefore infective for a very long time, years in fact, but that no further development takes place until they are swallowed by a pig. In dry weather these eggs may be blown about by the wind from an infected litter to a clean one.

Infestation may take place in many ways. The feeding habits of the pig make it more liable to parasitic infestation than are other animals; it eats all sorts of offal and sniffs about the ground, during which time it may pick up worm-eggs.

The eggs may adhere to the udder of the sow, and in this way the young sucking pig becomes infested. Animals may become infested by licking either themselves or one another, for it can be easily imagined how eggs adhere to the skin when the animal lies down in an infested sty.

The eggs after being swallowed pass to the small intestine, when a most remarkable and interesting migration commences. Shortly after the egg is swallowed, the digestive juices soften the shell, which splits, and a small embryo is released. This embryo, on being set free from the egg, attacks the wall of the intestine, and commences to burrow into it; in this way it reaches the blood-stream, passes to the liver and then on to the heart, and finally to the lungs. When it reaches the lungs it leaves the blood-stream, and burrows through the tissue of the lung until it reaches the small air tubes or bronchii. This movement or migration from the bowel wall to the lungs takes about nine days, and it is absolutely essential for the further development of the embryo that it should make this remarkable journey through the animal's body.

The presence of the embryos in the lungs lead to symptoms similar to bronchitis, and the animals cough and sneeze frequently. They do not remain long in the lungs, but pass up the windpipe to the mouth and are swallowed, and eventually, for the second time, reach the small intestine where they grow and become adult worms. In about

two months the female commences to lay eggs for the next generation, so that a fresh crop of worms may appear every three months.

Let us go over this development again:—

1. The pig swallows the eggs, which may be present anywhere in the sty.
2. The larvae hatch out in the intestine and then travel through the bowel-wall to the blood-stream, and thence through the liver and heart, and reach the lungs, where they cause coughing and lung trouble.
3. They then crawl up the windpipe, are swallowed, and reach the intestine, where they grow to be adult worms in two months.
4. The female lays large numbers of eggs which pass to the exterior where, in a few weeks, a larval stage is developed within the egg.

No successful treatment is known for expelling the worm embryo from the lungs during this migratory journey, but after they leave the lungs and have become settled in the small intestine they may be successfully treated with a drug known as santonin. The best time for this treatment is about three weeks after the symptoms of lung trouble are first noticed. By this time the worms are well developed, but the females have not yet commenced to lay their eggs. Of course, if a pig is known, or suspected, of being infested with the adult parasites, treatment with santonin may be proceeded with at any time.

I shall give the dosage of the drug a little later after I have discussed the whip-worm, for which a similar treatment may be adopted.

The Whip-worm.

The whip-worm is a parasite of the pig sometimes found in Victoria, and, like the round worm, it may cause immense wastage in piggeries. As the name indicates, the parasite is whip-shaped, the rear end being thick, and the front end thin and tapering; this thin front portion is usually found embedded in the lining of the intestine. This worm, which is usually about 2 inches in length, is of a pinkish colour. The method of propagation is simple; the female lays the eggs which pass to the exterior where after a short time they become active. These are swallowed by pigs, and in the intestine development into the adult worm takes place in a comparatively short time. As already stated, this worm may be treated in the same way as the round worm.

Treatment.

Santonin is a drug which may be used for treating both round worms and whip-worms; it is rather expensive, but is easy to administer, and is quite safe if it is always followed by a saline purge. The dose is two (2) grains for a pig one month old, increasing by 1 grain for each month of age, until the pig is seven months old or older, when the dose is 8 grains. So that for a two months old pig the dose is 3 grains; for one four months old 5 grains, and so on.

The pig should be prepared for the medicine in the following way. A sloppy feed should be given in the morning; and if the animals are over the age of three months they should not be fed again during the day. Younger pigs should be allowed to have a little milk or sloppy food. In the evening the santonin is given, each pig being dosed either

separately (which is no easy job), or several may be dosed together by mixing the requisite number of doses with a small quantity of sloppy food. For example, if twelve pigs six months old are to be dosed, then thoroughly mix 84 grains of santonin with a small quantity of gruel, and distribute this well along a trough and allow the pigs to take it freely.

Twelve hours after the santonin is administered, a dose of Epsom salts should be given. The dose is $\frac{1}{4}$ ounce for a pig one (1) month old, the dose increasing by $\frac{1}{4}$ ounce for each month of age; for example, a pig two months old would require $\frac{1}{2}$ ounce; one three months old $\frac{3}{4}$ ounce, and so on.

The salts should be given mixed with a little warm gruel from a trough; but sometimes it is necessary to add a little solid food to disguise the taste of the salts. An hour or so after the salts have been administered the pigs should be given their usual morning meal. The dose of santonin may be repeated if necessary in a month or six weeks.

Prevention of Worms in Pigs.

Having spoken about treatment, let us now deal with what is even more important—prevention. The first step in the control and elimination of parasites is to treat the infected pigs as suggested so as to expel the worms from the intestines: after this all droppings, &c., should be carefully gathered up and placed in a dump to which the pigs cannot gain access. The sties should be thoroughly cleaned, all litter removed, and the walls and floors well scrubbed with a solution of boiling water and washing soda.

The worm eggs are very resistant, and strong solutions of ordinary disinfectants often fail to destroy them, hence the necessity of using boiling water. All pigs should be well washed with soap and water before being allowed to re-enter the sty; this will kill any eggs adhering to them and which might be subsequently licked off by other pigs.

As a protection to young pigs on properties where worms have been prevalent the following procedure should be adopted:—Fourteen days before the sow is due to farrow she should be dosed with santonin, and shortly after this she should be well washed with warm water and carbolic soap. She should then be put into a pen cleaned as suggested and within ten days after farrowing the sow and the litter should be removed to a paddock which has never previously had pigs in it, or which has been ploughed up since pigs last occupied it. No other pigs should be allowed in it, and the young should be kept on this pasture for at least four (4) months.

If the young pigs do not appear to be doing well a dose of santonin should be administered when they are about two months old. In all sties and pig-paddocks water should be supplied by pipes or in pails, and on no account should the young pigs have free access to pools or dams. Adequate drainage of all sties and paddocks is essential, and animals should not be fed from the ground, but from troughs which must be kept scrupulously clean. The manure should be removed frequently and thoroughly.

It should be remembered that if parasitic diseases are to be kept in check, then cleanliness and proper methods of feeding are essential, because no animal can exist in contact with dirt and filth without sooner or later being subject to an outbreak of disease; this is particularly true in regard to parasitic diseases.

The pig-breeder who adopts the methods I have indicated will find that he will be more than repaid by the decrease in mortality among his young pigs and the better condition of his stock generally.

In conclusion, let me remind all pig-breeders that worms and pigs are a money-losing combination.

DAIRY CLASSES AT CAMPERDOWN.

Official Opening by Minister of Agriculture.

The second of the series of dairy classes inaugurated by the present Government, was opened at Camperdown, on the 9th July, by the Minister of Agriculture, Mr. Slater. In explaining the purposes of the classes, Mr. Slater pointed out that the need for the establishment of a dairy college or colleges was recognized, but the Government was faced by two major difficulties. The first was that of finance, and the second that of deciding the most suitable site. In the meantime the dairy classes had been established to serve the industry until the difficulties in the way of a college could be overcome.

There was, he said, a good deal of misconception as to the value of the dairying industry to the State. Actually dairying was the most valuable of all Victoria's rural industries. Over the past three years the average value of the dairy products of Victoria had been £10,409,908, while wheat to the average value of £9,401,836, and wool to the value of £8,799,914 had been produced in the State in the same time. Again there were 46,000 people engaged in the dairying industry in Victoria, 184 factories were in operation, and it was estimated that at least £80,000,000 capital was invested in the industry.

Unfortunately the people connected with dairying were not being remunerated as they should be. Their industry existed to-day mainly because of the unpaid labour of women and children.

Obviously it was the duty of any Government to attempt to stabilize such an important industry, and to make it possible for those engaged in it to obtain the remuneration they deserved. These classes were a means to that end. For the next fortnight, said Mr. Slater, the accumulated experience of the expert officers of the Department of Agriculture would be available to those who were attending the class and, if the methods advocated were adopted, a decided step forward would have been taken. It had to be recognized that, in many respects, the dairying industry of Victoria was not as efficient as it might be. It could not be claimed to be efficient while the average production of the cows was in the vicinity of only 170 lb. of butter-fat a year. At the same time much was being accomplished by the herd testing movement, with which the Department of Agriculture was closely associated, and which was being assisted financially by the Government to the extent of £15,000 per annum. That that money was being well spent, was shown by the marked improvement in production effected in the herds undergoing tests. To-day, in the Associations conducting herd testing, there were 150 herds with an average production of over 250 lb. butter-fat; 60 with an average product of over 300 lb.; eighteen over 350 lb.; and four over 400 lb. These results were due largely to the work of the Associations and the Government.

BREEDING OF POULTRY.

By W. C. Rugg, Chief Poultry Expert.

For some years past utility poultrymen have found that the production of eggs is the most profitable branch of poultry farming. If birds are to lay large numbers of eggs, particularly at the time of year when the highest prices are to be obtained, then the poultry-farmer must give considerable attention to several matters. But the great essential for success in high egg production is careful selection of breeding stock. Then they must be properly fed and housed; but, first of all, one must have birds that are worth housing and feeding.

The Selection of Strong, Healthy Birds Essential.

In nature the law of the survival of the fittest obtains—the strong survive and the weaklings die off; consequently, the young inherit a sound constitution from the parents. But, with domesticated poultry, too often the unfit are mated and become the parents of progeny lacking constitution and vigour, and highly susceptible to disease.

In an interesting article, Mr. Tom Newman, one of England's greatest authorities on breeding, asks—"Should we not study health as ardently as we study disease? There are so many points from which we may profitably do so: breeding, incubation, brooding, housing, feeding. Are they not worth as much thought as we give to bacteria, vaccines, serums, disinfectants, antiseptics, and all the tonics, cures, and preventatives, and the scores of remedies for every conceivable ailment from which fowls suffer, the virtues of which are constantly dinned in our ears, until we ourselves are doped into the belief that birds cannot be kept in health without them?"

Without the least wish to minimize the value of the work done in the laboratory, cannot we, as practical men and women, give a little more attention to the health of our stock, and try to discover in how far our methods are responsible for the susceptibility of our birds to disease?

That is advice to which every poultryman in Victoria should give very earnest consideration. He should also give some thought to the questions as to what extent poultry-farmers are responsible for the tremendous loss that takes place every year owing to the infertility of eggs sold for breeding purposes, mortality in chicks, weak stock, and loss from small eggs. I venture to say that the mating of unfit birds is responsible for most of these troubles.

Another English authority, Davenport, says:—"Anything which weakens the parent constitutionally, which lowers its tone, reduces its vital powers, and lowers its rate of living must of necessity affect the quality of germinal matter it may produce and the constitutional vigour of its descendants."

Now, it has often been said that selection is the basis of all improvement, and, as far as poultry is concerned, it is the only check on degeneracy.

The selection of birds for breeding is one of the most important factors in the fight against disease and the preservation of health and vigour in our flocks. The laying hen is like any other piece of

fast-running machinery. Unless a bird be properly built to do the work required, and supplied with the right material to turn out the desired product with the minimum amount of wear and tear, the years in which she will be a profitable layer will be short.

Standard Size to be Aimed At.

The two most important things to aim for are good-sized eggs and a good average number of them. Therefore, the basis of selection should be standard size for the breed, constitutional vigour, and vitality. I mention standard size for the breed first, because we find that, although size of egg is generally admitted to be an inherited factor in the bird, we also know that the danger of small eggs being laid by hens increases with every ounce they are under the standard weight for the breed. Constitutional vigour and vitality are absolutely essential if birds are to produce pullets that will be able to stand the strain entailed in producing a profitable number of eggs in twelve months.

Many people do not realize that they possess in their hens probably the most efficient machines in the world for turning raw material in the shape of grain, &c., into one of the most nutritious foods for human consumption. A good hen will lay from 180 to 200 eggs in a year, which is five to six times her own weight. In the case of the exceptional hen, owned by Mr. Mentiplay, which laid 334 eggs at the Burnley competition, the eggs weighed nearly ten times as much as the hen herself. When it is realized that she had to eat and digest sufficient food for her own bodily upkeep, as well as enough to manufacture ten times her weight in eggs, it brings home to us what a marvellous piece of machinery is contained in the body of a hen, and also reminds us how necessary it is to make strength and vitality the basis of the selection of our breeding stock. Without these a breakdown must occur, which means loss of eggs, sometimes sickness in the flock, with consequent financial loss, to say nothing of the worry and extra labour entailed in looking after sick birds.

Birds Not to be Judged Only by Number of Eggs Laid.

The poultryman of to-day is ever on the look-out for more prolific birds. High scores put up by hens have a tremendous fascination for some, and I am still meeting far too many of them who are sacrificing size and vigour for high single test scores, with the result that, when these birds are used as breeders, a large number of their eggs are infertile, in many of them the young die in the shell, and of those that do hatch too many of the chicks are weak in body and never become heavy layers. If we consider the life of many utility birds, the quality of their progeny is not to be wondered at.

In the first place, the chick is artificially hatched, is confined in an artificial mother till it is six or eight weeks old, is then too often placed with a number of others in a shed or small run, with little grass and small range. When about five months old the females are drafted to a single pen to be under control for twelve months, so that the number of eggs they lay can be ascertained. Later they moult, still under cover, and when starting to lay are placed in the stud pen to be bred from, and are often mated with a cockerel which has been

hatched, brooded, and reared under similar conditions and penned in a shed, often in a coop, until he is wanted by his owner for the breeding pen or until a buyer comes along.

I think it is impossible to keep up the strength and stamina of our birds if we continue to breed from such stock. Birds intended for layers only do not require as much care as those required for breeding. Layers may be put in sheds and endeavours made to get them to lay as freely as they will, but stud birds should be reared under natural conditions; they should be given as much free range as possible, and fed only on plain, wholesome meals and grains.

Nobody appreciates the value of single testing more than I do, but I find quite a number of men who value birds solely on the number of eggs laid by them, without considering the stamina of the birds, or the conditions under which the eggs were produced, or even the size of the eggs.

What is Safest Guide in Selecting Breeding Stock?

Perhaps the greatest value in single testing is that it enables us to determine family traits in our birds; these are really the breeders' safest guide. For instance, if a hen lays 300 eggs in a year, and several of her sisters are poor layers, apart from the extra value of eggs laid by her, she has no special value; but, if we have four or five sisters that average 250 or over, this fact goes a long way to prove that high egg production is a family trait in that line of blood. And this trait is likely to be transmissible, and any one of those sisters is, in my opinion, of greater value as a breeder than the hen that lays 300 eggs, if she be the only high producer of her family.

A most important fact to keep in mind in mating for high egg production is that, if any quality in a bird is stimulated to excess (which is possible up to a point and for a limited time), and the other necessary qualities are not developed to a similar degree, there is sure to be a breakdown. For instance, if selection be made on egg records alone, and only the highest producers used as breeders, without giving due consideration to type and size, the stock must deteriorate.

It is the experience of most men who line-breed for egg production or other single characteristics that there is a natural tendency for birds to deteriorate in size, and a falling-off in size is fatal to success in egg production for market.

Therefore, a bird not up to standard weight for her breed should never be used as a breeder.

Vigour and size are, I am sure, dominating factors in deciding the size of eggs laid by our birds. Although it is admitted that some small birds lay good-sized eggs, as a general rule size of egg in our utility stock depends on the size of the layer.

The difference in price for large and small eggs is slowly, but surely, bringing home to the producer the fact that the production of small eggs is uneconomical.

It has been generally accepted by breeders that the quality of high egg production is transmitted from a hen through her son to his daughters, and Dr. Raymond Pearl goes so far as to say that, as long as the male carries the fecund quality in a high degree, it is of much less importance in the females with which he is mated. Personally, I like the hens to have fairly good scores, as I know of many hens

which have transmitted to their daughters the characteristic of high production. We know that many of our successful commercial poultry-farmers select their hens on size and vitality, irrespective of the number of eggs laid by them, but they are very particular that the male birds should be the sons of high producers.

In conclusion, it is difficult to choose birds with all the desired qualities, so the best that can be done is to select females with as many of these qualities as possible, and, when selecting the male, see that he is strong in the qualities that the females are weak in, always remembering that, although high scores on both sides are desirable, constitutional vigour and vitality are absolutely essential if profitable pullets are to be reared.

STARTING A POULTRY FARM.

[*Notes of a lecture delivered by Mr. H. M. Gedye at Blackburn.*]

It is my intention to touch on poultry-farming from a beginner's stand-point only, and I hope to do so in a different manner from the customary method of lecturers. During the many years I have been interested in poultry I have attended innumerable lectures on feeding, selection, and care of breeders, feeding of breeders, incubation and chick rearing, caring of moulting birds, diseases, &c. These dealt only with poultry farming when one is started. I intend this lecture for those who purpose *starting* in the poultry industry.

When one wishes to begin poultry farming it is necessary that he should take stock of himself; to be certain of his suitability for the work. If this were done, in my opinion, 75 per cent. of the failures would be eliminated, and poultry farming would hold a higher position in the financial world and community generally than it does at present. As it is now, it is difficult for the person about to start poultry farming to obtain financial assistance, because failure is usually predicted. It is surprising the number of people one meets who wish to start in the poultry industry. People who have spent most of their lives in business—probably indoor work, such as office work, &c.; others who are semi-invalids, and people with disabled limbs. Most have little or no capital. But few realize the work which is before them and that money is necessary to build up a reasonable one-man plant. Far too many are under the impression that all they need to do in a poultry farm is to throw out the grain to the birds and then gather the eggs. They will soon discover, to their sorrow, that there is little ground for such an impression. If one is a footballer, cricketer, or sport enthusiast, he will have to contemplate giving less time to sport, if not giving it up altogether, for he will soon find that the attention required for live stock will not take second place to anything. Poultry needs, first of all, enthusiasm; one who after studying them for a few years and can then enthuse or feel a thrill of personal pride when viewing his own birds—that is the man who will succeed, providing, of course, that he uses judgment on the business side of it.

The Amount of Capital Required.

Now, when one has decided that he is able and willing to carry on a poultry farm, his next consideration should be the manner of making a beginning. He can begin in two ways—(1) By purchasing stud birds and hatching and rearing his own chicks, by means of incubator and brooder (I am eliminating the broody hen as a method only fitted for a real backyarder); (2) by the purchase of day-old chicks from some reputable breeder. Of the two, I prefer and recommend the latter method. The buyer can be supplied with the number required in one or more deliveries, according to the capacity of his brooder house. Thus he is enabled to rear chickens of even size and age, which he could not do if he incubated in smaller lots himself. Another advantage is that he can get through his brooding season in, say, three months, instead of its dragging through a big part of the year.

Let us take the case of a man who purposes starting with 800 pullets, with the intention of ultimately increasing his flock to 1,600. This will necessitate purchasing at least 2,000 day-old chicks at the cost of, say, £126. Having arranged for chickens, he will require brooding equipment, and it will be necessary to erect a brooder house at a cost of about £100. Pens to hold the 800 layers will entail a further expenditure of £300; thus the outlay for purchase of stock and establishing them will amount to £526. (The prices given for building includes the cost of labour.) The chicks will, of course, have to be kept until maturity, and the cost of feeding them differs from season to season. On looking over my books I have found calculations made by me about eighteen months ago relating to the cost of keeping a flock of birds. I might say in my defence that these figures were made up for my own edification only; therefore, I shall give only my conclusion, which is—I estimate that, on this basis of costs, each pullet would cost about 4s. 6d. raised to maturity, not including the initial cost of chicken, but including the cost of cockerels to market age.

Thus the estimated cost of bringing to maturity a flock of 800 layers is £180, and the estimate of the total amount required is increased to a total of £700. This amount, however, can be reduced by £150, which is about the amount that would be received for the cockerels at 7s. 6d. each. A further deduction of £30 for the first eggs could also be made. Therefore, by the time the flock has reached maturity the probable total cost would be £526. There is yet another item to be added to the debit side; that is, household expenses for eight months at £4 per week, or £136 in all, making the grand total of out-of-pocket expenses £650, and allowing, say, £50 for provision of extras, £700. Of this amount it must be remembered that £400 for brooder-house and pens is a permanent asset, and living expenses (for which £136 has been allowed) is an item to be faced no matter what one is doing. These figures go to show what a large outlay is necessary when a person intends to make poultry farming his means of livelihood. Now I am in the happy position of being able to give actual figures of what income one may expect. I formerly mentioned that £30 should be received for the first eggs. For the eight months, February to September, the returns from the 800 pullets should show £314. For the next three months I estimate the receipts for eggs at £138, making a total income of £452 for the year following hatching.

As 31st March appears to be the general date taken for the finish of a bird's laying year, I shall add an amount of £88 to the year's total, making the net profit from 800 pullets for fifteen months £540.

This is the return to be expected from the first season's purchase of chickens. Within twelve months of starting there should, of course, be another batch of chickens well on the lay.

In arriving at the amount required for starting a poultry farm on the scale suggested, no allowance has been made for the purchase of land and house. Thus, unless one has some capital with which to make a beginning, it will take him so long to build up his plant that poultry farming will eventually be a drudgery for him, and when that happens failure follows only too often. In any case, I am attempting to look at poultry farming from a commercial stand-point; hence one of the reasons why I have taken 800 birds as the start, with the ultimate flock number of 1,600.

The Necessity for Continual Observation in the Poultry Yard.

One of the principal things a person should cultivate when he has a flock to attend to is observation. No matter what particular work one is doing amongst one's birds, he should try to cultivate a habit of self-conscious observation. He may see a bird that is looking a bit "dopey" or has a watery eye. If so, do not wait till to-morrow to give attention to such a bird. If treated at once, the chances are that it will be back in the pen inside a day or two, but if left for twenty-four hours it may be a week or two, and if neglected for a further day or two the chances are that it will never recover. Not only is observation necessary for sickness; one must also notice whether one's mash hoppers are feeding properly; that the water system is running freely; also that the perches are free from vermin. One must try to cultivate the habit of becoming aware of all these details with his sub-conscious mind. Regarding attention to vermin, this is very important. Perches should be attended to regularly, at least every two or three weeks in the warmer weather, and every month in the winter. Because one sees no vermin is not an adequate reason for failing to make sure there is none present.

Feeding.

If poultry farmers would inspect perches regularly, as stated, the task of combating vermin would not be a difficult one. The feeding of a flock is purely a matter of mixing various offals, meats, and grains to get as close to a balanced ration as possible. There is not only one balanced ration, but dozens. If birds are laying well on any particular ration it should on no account be changed. During lectures on feeding it is usual for poultrymen to be busy with their pencils, taking down the lecturer's formula, with a view of substituting it for their own. This is very often a mistake, but, if it should be that one's birds require an altered ration, any change should be made very gradually. I have heard quite a number say, "Give the birds a change of diet," but I say emphatically, "No." I have proved to my cost on more than one occasion during drought years that a change of food may be unwise. One change-over that I have in mind cost me over £250 in loss of eggs. First of all, one must be satisfied that his feed is as close to a balanced ration as possible; and, when I say feed, I not only mean mash food but also grain, for the grain must come into the balancing of a daily ration also, although this is rarely done.

Recently I was discussing the cost of feeding, and I was informed that a number of poultry men considered the upkeep of a bird, varied from 2¼d. to 2¾d. per week. This rather astonished me, so I looked up calculations that I made twelve months previously, which showed my cost of feeding 1,200 laying pullets to be 1 9-16d. per bird. In this estimate the mash and grain were weighed weekly, and there is no doubt about the correctness of the figures, for, to make doubly sure, I checked the calculations when preparing these notes. On this occasion I took 440 pullets and checked that off by 930 first-year hens, and I am absolutely positive of my figures, as the amount of mash consumed was booked to these particular pens every week, and I weighed the grain for each estimate. I give you hereunder the actual figures:—

440 W. L. pullets consumed 413 lb. dry mash and 4 bushels grain in one week; this works out at 15 oz. dry mash and 9 oz. grain each bird, the actual cost of which is 1⅝d. The 930 first-year hens differed slightly, their consumption being, for the week, 756 lb. dry mash and 9½ bushels grain, working out at 13 oz. dry mash and 10½ oz. grain per bird. The cost here is 1 9-16d. per bird. In addition to this feed, the birds had the necessary quantity of green feed, which is grown on the farm, the cost being infinitesimal.

The next important matter I wish to touch on is the necessity of bookkeeping. Too many are apt to consider their pocket their bank. Every amount should be recorded, even if only a few pence is taken or spent. On the farm, mark it on a slate or a book for that purpose, and enter it into the journal at the end of the day or week. A simple method in suitable bookkeeping on a poultry farm is to obtain about a seven-money-column book and enter expenditure on one side under an appropriate heading as follows:—

EXPENDITURE.

——	Cheque.	Seed.	Labour.	Cartage.	Rates and Taxes.	Sundries.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Jones	30 0 0	30 0 0				
Smith	6 0 0	..	6 0 0			
Green	1 0 0	..	..	1 0 0		
Income Tax ..	5 0 0	..	..	..	5 0 0	
Stamps	1 0 0	..	..	..	..	1 0 0
	43 0 0	30 0 0	6 0 0	1 0 0	5 0 0	1 0 0

RECEIPTS.

Dates.	Bank.	Eggs.	Stock.	Stud.	Manure.	Bags.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
March 6	36 10 0	25 0 0	6 0 0	1 5 0	3 0 0	1 5 0
March 14						
March 20						

Always place your debit (expenditure) on left side and credits (receipts) on right side of book.

Conclusion.

In conclusion, let me remind those who desire to attempt poultry farming on a payable basis that they will need to expend a reasonable amount of capital to ensure an adequate return. Secondly, that they must have a liking and sympathy for the occupation, and be able to give close and continual personal attention to their birds. Thirdly, that one's working hours must be whatever his flock demands, and he must give it to them ungrudgingly. Also that Saturday afternoons, Sundays, and holidays are all one to the birds, and regularity of the various duties of feeding, &c., is vitally necessary, because a flock can tell feeding time almost to the tick, and if they are kept waiting long they will fret. Fourthly, at all times use observation; get the habit of seeing three or four things at the same time. If any of you have studied Pelmanism, you will remember that sub-conscious observation is the first lesson taught. Fifthly, when you have a good feed formula, stick to it; do not take notice of a friend's advice to change over to something better, for a man may have a lot of friends and each one may have several formulas. Sixth and lastly, keep accurate accounts, so that one will absolutely know the amount of business he is doing and whether it is paying or not.

COLERAINE POTATO CROP COMPETITION.

(Conducted by the Coleraine Agricultural Society.)

Report by the Judge, J. T. Ramsay, Potato Expert.

Some Remarkable Yields.

The results obtained from the crops submitted for competition this season are remarkable for various reasons. First, a record number of entries was received, and no fewer than 34 different crops were subjected to examination. Over 200 miles by road had to be covered in the course of inspection. The districts represented were Coleraine, Casterton, Merino, Paschendale, and Denham Green. Remarkable ranges of yield were obtained, the variation being from 5 to 25 tons per acre. This latter yield is probably a record for the State, and is certainly the heaviest crop that the judge has ever actually witnessed being harvested. The phenomenally heavy average for the 34 entries was approximately 12¾ tons per acre, while if the average of the ten heaviest yielding crops is taken, the remarkable average of no less than approximately 18¼ tons per acre is given. The abnormal season of course had much to do with these yields, which probably will not be equalled for many years. The early portion of the season was very dry, but abundant rains commenced in mid-January and recurred at

short intervals right into April and May. These had the effect (in combination with mild growthy temperatures) of stimulating development of the plants to the degree which produced these extraordinary results.

Notwithstanding the ultra-favorable nature of the season, much credit for the heavy yields must be given to the quality of the soil in these districts, and its suitability for the production of potatoes. It is a notable fact that it was not until the Coleraine Society established this potato crop competition (much of the credit of which establishment is due to Mr. A. G. Turnbull, of Winninburn North) that these districts became recognized as areas well suited for potato production. It will be remembered by those interested that last year's average for this competition, with ten entries, was 11 tons 15 cwt. per acre.

The pinnacle of perfection in potato cultivation has not yet been reached in these districts, however, in spite of the evidence of these high yields. Much improvement could be made in the quality of the strains grown—particularly by selection of the best types of plants and working up from these, or by securing seed from growers who have made a specialty of purity of stock and high productiveness of the right types. The attention of competitors, therefore, is strongly recommended to these points.

Diseases were only slightly in evidence in a few crops, and the percentage of damage from these was infinitesimal. The slight damage caused, however, could be further eliminated if the practice were adopted of dipping seed for an hour and a half in a solution consisting of 1 lb. formalin to 30 gallons of water.

Considerable irregularity in the spacing between rows was found. This ranged from 22 rows per chain to 39 rows. The former is as much too wide as the latter is too narrow. The majority of the competitors favoured 28 to 30 rows per chain. In practice, and as the result of many observations from tests, from 29 to 31 rows can be safely recommended. These spacings allow ample room for horse inter-tillage during the growing period, without giving the crop much chance in normal or good seasons of developing tubers of coarse quality.

The standard of cultivation throughout the entries was of a high order, as can be seen from the points awarded under these headings. The piece of land producing the heaviest yielding crop (which was beaten into second place on account of quality of tubers) is unique, and not typical of any great area in the district. The character of this land is a river silt of beautiful texture and richness.

An exceptional feature of the competition was the entry of a self-sown crop. This crop came up after the faliure, from frosting, of a maize crop which succeeded a potato crop last season. In spite of the fact that it had no cultivation, it yielded the heavy tonnage of 16 tons 13 cwt. per acre, but, chiefly because of the crowding of the plants, the quality was low. This is the first time in the experience of the writer of a self-sown crop yielding so heavily, or of such a crop being entered in a competition.

Considerable interest was manifested in the competition by growers, which cannot but have a beneficial influence. The leavening of friendly rivalry created must of necessity promote interest and effort to increase

knowledge of how soils can best be husbanded to increase their productiveness, and how crops can best be treated to increase their prolificacy.

The Coleraine Society has to be congratulated on increasing the value of the Cup to the winning crop, and the prize money to the runner-up; also on its enterprise in stimulating interest in agriculture among its members by conducting the competition.

Details of Awards.

Grower.	Rows per Chain.	Cleanness.	Evenness.	Quality.	Weight per Acre.	Points for Weight.	Total Points.
Possible Points ..	..	**10**	**10**	**35**	..	**45**	**100**
					T. C. Q.		
H. A. Watts ..	23	10	9	30	23 16 0	42	91
T. Taylor, sen. ..	32	8	8	27	25 2 0	45	88
A. Elwood ..	30	10	9	32	20 1 0	36	87
A. Bickley, sen. ..	28	10	9	34	18 10 0	33	86
A. W. Pepper ..	28	9	9	30	19 14 0	35	83
G. Wise ..	34	9	9	31	17 11 0	31	80
C. W. Parrington	30	10	10	32	15 0 0	27	79
C. Brown ..	33	10	9	35	13 16 0	25	79
C. W. Parrington	30	10	9	34	12 11 0	23	76
T. Dalton ..	22	9	8	29	16 17 0	30	76
Fitzgerald and Son	32	10	9	33	12 5 0	22	74
W. R. Taylor ..	34	9	9	32	12 7 0	23	73
Ivan Shaw ..	34	9	9	31	12 15 0	24	73
C. J. Troeth ..	26	9	8	30	13 9 0	25	72
A. G. Turnbull ..	29	7	8	27	16 13 0	30	72
A. Taylor ..	28	10	9	33	11 5 0	20	72
G. Wise ..	30	9	9	30	11 10 0	21	69
A. G. McPhail ..	26	8	7	29	13 18 0	25	69
C. O'Brien ..	28	10	8	29	11 15 0	21	68
J. R. Shady ..	26	10	10	31	9 5 0	17	68
Jas. Clynes ..	28	9	9	32	10 0 0	18	68
J. Mason ..	28	10	10	31	8 6 0	15	66
F. Dalton ..	25	10	9	30	8 18 0	16	65
W. McDonald ..	22	10	9	30	8 9 0	15	64
W. McDonald ..	39	9	8	31	9 1 0	16	64
Fitzgerald and Son	33	10	10	31	7 3 0	13	64
Ivan Shaw ..	34	9	9	31	7 7 0	14	63
T. Gazard ..	28	7	9	30	9 0 0	16	62
H. J. McCombe ..	32	10	9	27	8 16 0	16	62
H. J. Munro ..	24	10	9	30	7 1 0	13	62
J. T. Ryan ..	28	10	10	32	5 0 0	9	61
W. Burchall ..	30	10	9	31	6 3 0	11	61
J. Glossop ..	24	9	9	31	5 15 0	11	60
A. Bickley, jun.	28	8	8	31	6 10 0	12	59

In allotting points for weight, the maximum of 45 is given to the heaviest crop, and points for the others *pro rata*.

Of the 34 crops judged in this competition, the average of approximately 12 tons 5 cwt. per acre was recorded, the ten heaviest averaging the extraordinary weight of 18¾ tons per acre.

REVIEW OF THE FRUIT EXPORT SEASON, 1928.

By J. M. Ward, Superintendent of Horticulture.

The quantity of apples and pears exported from Victoria during the 1928 season was easily a record one for the State. Up to the 30th June last, 927,615 cases of apples and 81,586 packages of pears had been shipped to countries outside of Australia.

The previous greatest quantity of fruit sent away in one year from Victoria was in 1926, when 459,904 cases of apples and 45,764 packages of pears were exported.

PORTS TO WHICH APPLES AND PEARS WERE SHIPPED IN THE 1928 SEASON.

(1st July, 1927, to 30th June, 1928.)

Destination.	Apples.	Pears.
	Cases.	Packages.
London	373,764	71,484
Hull	141,812	..
Liverpool	106,521	8,674
Rotterdam	38,451	..
Hamburg	245,878	..
Dunkirk	52	..
Antwerp	17	..
Port Said	5,702	..
Colombo	2,347	..
Mauritius	250	30
Durban	476	..
Calcutta	16	..
Sandakan	2	..
Belwan Deli	30	..
Medan	61	15
Batavia	2,035	431
Macassar	715	..
Samarang	94	51
Singapore	3,357	98
Sourabaya	3,751	692
Ocean Island	94	..
Nauru Island	119	..
Manila	949	33
Hong Kong	1,122	78
	927,615	81,586

The total number of ports to which we shipped our fruit was 23. The great part, however, was sent to English and European markets. Of the total quantity, 906,495 cases of apples and 80,158 packages of pears were despatched to England and Europe; the remaining 17,855 cases of apples and 1,281 packages of pears were sent to various ports in the East.

FRESH FRUIT EXPORTS OVERSEAS FROM VICTORIA—FROM 1ST JULY, 1927, TO 30TH JUNE, 1928.

PACKAGES.

Destination.	Apples.	Pears.	Grapes.	Oranges.	Lemons.	Mandarins.	Plums.	Peaches.	Passion Fruit.	Melons.	Grape Fruit.	Total.
London	373,764	71,484	89	20	..	..	..	..	..	..	..	445,357
Hull	141,812	..	..	..	..	..	..	..	..	..	..	141,812
Liverpool	106,521	8,674	..	..	..	..	..	..	..	..	..	115,195
Hamburg	245,878	..	..	..	..	..	..	..	..	..	..	245,878
Rotterdam	38,451	..	..	..	..	..	..	..	..	..	..	38,451
Antwerp	17	..	..	..	..	..	..	..	..	..	..	17
Dunkirk	52	..	..	..	..	..	..	..	..	..	..	52
Port Said	5,702	..	..	..	..	..	..	..	..	..	..	5,702
Colombo	2,347	..	962	..	..	..	..	..	..	..	..	3,309
Mauritius	250	30	..	..	..	..	..	..	..	..	..	280
Durban	476	..	..	..	..	..	..	..	..	..	..	476
Calcutta	16	..	..	..	..	..	..	..	..	..	..	16
Sandakan	2	..	..	..	..	..	..	..	..	..	..	2
Belawan-Deli	30	..	..	9	..	..	..	..	..	..	..	39
Medan	61	15	9	13	..	..	2	2	..	..	3	105
Batavia	2,035	431	942	70	2	..	34	46	..	..	..	3,560
Macassar	715	..	85	..	..	..	4	4	..	..	..	808
Samarang	94	51	84	10	..	..	10	10	..	..	..	259
Singapore	3,357	98	1,808	4	..	..	33	34	..	..	..	5,334
Sourabaya	3,751	692	880	10	..	..	16	18	..	..	..	5,367
Ocean Island	94	..	6	66	24	..	..	..	6	..	..	196
Nauru Island	119	..	6	131	1	..	..	..	6	..	..	263
Manila	949	33	345	..	..	..	..	..	..	..	..	1,327
Hong Kong	1,122	78	501	..	..	..	..	..	..	..	..	1,701
New Zealand	..	..	1,885	5,819	1,447	305	..	..	..	32	..	9,488
	927,615	81,586	7,602	6,152	1,474	305	99	114	12	32	3	1,024,994

GRAND TOTAL OF FRUITS SHIPPED TO ALL PORTS.

	Totals.
Apples	927,615
Pears	81,586
Grapes	7,602
Oranges	6,152
Lemons	1,474
Mandarins	305
Plums	99
Peaches	114
Passion Fruit	12
Melons	32
Grape Fruit	3
	1,024,994

PORTS TO WHICH APPLES AND PEARS WERE SHIPPED IN THE 1926 SEASON.

Destination.	Apples.	Pears.
	Cases.	Packages.
London	227,903	43,113
Hull	56,346	..
Liverpool	55,268	..
Southampton	20,254	1,193
Glasgow	12,436	..
Hamburg	77,537	..
Bremen	4,000	..
Port Said	1,000	..
Colombo	1,785	..
Mauritius	25	..
Samarang	465	182
Sourabaya	202	523
Batavia	1,122	349
Macassar	650	120
Singapore	469	254
Suva	10	..
Hong Kong	340	30
Timor Dilly	6	..
Ocean Island	38	..
Nauru Island	43	..
Durban	5	..
	459,904	45,764

The fruit exported to the United Kingdom and European ports was conveyed in 37 steamers, and that to the East in about four boats which make three or four trips each year.

The Cost of Shipping.

The freight and other incidental charges on the apples and pears shipped during the 1928 season amounted to a total of £303,568. This sum includes only the costs from the ship's side in Melbourne until the fruit is submitted to the buyer at the port of destination. (For the sake of convenience, the apples and pears exported to the East are included in the total costs of all the fruit shipped.) The details of the charges per case are made up as follows:—

Apples.	Per Case.
	s. *d.*
Steamer freight	3 6
Insurance, B/L, Stevedoring, Coopering, Duty Stamps	0 4¼
Forwarding	0 3
Handling Charges, London*	1 2
Brokerage	0 9
Exchange (1d. to 1½d.)	0 1
Advertising	0 0½
London	6 1¾
Other Ports	5 11¾

* 2d. less for Other Ports.

Pears.	Per Case.	Sets of Three Trays.	Bushels as Half Cases and Two x Half Cases.
	s. d.	*s. d.*	*s. d.*
Steamer Freight	3 6	4 2	4 6
Insurance, B/L, Stevedoring, Coopering, Duty Stamps	0 4¼	0 4¼	0 4¼
Forwarding	0 3	0 3	0 3
Handling Charges, London*	1 2	1 2	1 2
Brokerage	0 9	0 9	0 9
Exchange (1d. to 1½d.)	0 1	0 1	0 1
Advertising	0 0½	0 0½	0 0½
London	6 1¾	6 9¾	7 1¾
Other Ports	5 11¾	6 7¾	6 11¾

* 2d. less for Other Ports.

The Growers' Returns.

It is not an easy matter to obtain the exact total figures for which the fruit was sold, therefore one can only make an estimate from figures on hand. From these, one is quite safe in estimating the average price realized for all the apples shipped at 11s. per case.

Thus for the total of 924,350 cases exported the return was		£508,392
Less cost of carriage of fruit to its destination	£279,445	
Charges for rail and road freight, cases, packing, wrapping paper, branding, picking, &c., say, 2s. 2d. per case	100,137	
		379,582
Net amount distributed to growers		£128,810

It can therefore be seen that the apple-growers who export pay away a considerable amount of money to ship-owners, fruit agents, and others. These costs may be minimized by having a really good organization under efficient management.

Districts from which Apples were Sent.

Apples for export were sent from 100 different railway stations in the State. Certainly the quantity from some of these stations was very small, whilst others sent large quantities. Harcourt despatched a greater quantity of apples for export this year than any other station in Victoria, the number approximating 200,000 cases.

Varieties of Apples Exported.

No doubt many growers and others will be surprised to know that during this year's export season, some 36 different varieties of apples were shipped to England and Europe. The chief varities, however, were Jonathan, Delicious, London Pippin, Cleopatra, Reinette de Canada, Rome Beauty, and Rymer. The odd varieties were sent in small quantities only.

There is no doubt that the shipping of so many varieties is a mistake. In fact the growing of fewer varieties by individual orchardists for local sales would give them better financial results than they now

get. Large lines of a few good commercial kinds are infinitely better than small consignments embracing a wide range of varieties. I would, therefore, urge on these growers, in whose orchards there are numerous varieties, to consider the advisableness of top-grafting the less profitable kinds with grafts from some of the commercial varieties.

An effort should be made to ascertan two or three varieties for a particular district, and orchardists in that district would be well-advised to concentrate on these instead of experimenting with dozens of different kinds.

Cases.

One regrets to have to draw attention to the quantity of low quality cases that were used by growers in practically all apple districts for export purposes. It is hardly conceivable that growers could be so short-sighted as to put really high-class fruit in such low-quality containers. Some of the cases were dirty-looking; others were badly made; in some, the timber was warped and split, which gave them a generally disreputable appearance. A purchaser of apples must surely draw conclusions that such cases surely contain mediocre or low-grade fruit, and thus is not prepared to pay as high a price as he would for fruit in a case of good appearance.

It must not be taken for granted that the majority of our cases were of low quality, for this was not so. Many of them had an appearance equal to those from any part of the world; the average case, however, could, and should, have a better appearance. Every grower should aim at having only the best for export purposes. The great majority of our growers' apples were of high quality when packed; this is all the more reason why such fruit should be packed in a first-class container, and thus please the eye of prospective purchasers.

Inspection.

Seeing that fruit for export was despatched from a hundred stations, it will be readily understood that a great deal of inspection necessarily took place after the consignments reached Melbourne. Indeed, half of the work was carried out at the ship's side. The facilities for fruit inspection in Melbourne are worse than those of any port in Australia from which fruit is exported. As many growers know, the only opportunity the inspectors then have to examine the fruit is during the time occuped in its transfer from the truck to the sling. In these circumstances, the marvel is that inspection is so well performed.

This year a greater amount of inspection was carried out in the country than hitherto. Ten inspectors were placed at country centres, and examinations were made at eighteen railway stations.

Unfortunately, there are difficulties in the way of carrying out more of the inspectional work in the country, and so minimizing the great amount of inspection necessary in Melbourne. The chief difficulty is that only a comparatively small number of cases are loaded at many of the stations. To examine fruit at such stations would entail unnecessary expense. If some central point at the port could be arranged so as to have the inspection done before the fruit reached the ship's side, it would greatly facilitate the examination, and all those interested would be directly benefited.

Reasons for Rejecting Fruit Intended for Export.

Of the 924,350 cases of apples submitted for export last season, 21,460 were rejected for various reasons, such as poor packing, immaturity, bad grading, codlin moth, bitter pit, over-ripeness, unsightly, stained, and undersized cases. The chief reasons for rejection were the presence of codlin moth and bitter pit, and the over-ripeness of fruit; these imperfections were the cause of approximately 53 per cent. of the total rejections. In many cases export was refused owing to bad packing and sizing, undersized and badly constructed cases, and undersized and badly bruised fruit. Such faults as these can be readily remedied by the grower giving the necessary attention to details. Departmental officers fully realize how the grower is rushed with work during the export season, but they also recognize that it would pay some growers much better to send less fruit and give greater care to grading and packing the smaller quantity.

The bad habit common to many packers of taking up the paper with the same hand as that with which the apple about to be wrapped is picked up is one of the chief causes of defects in apples being overlooked. Either this habit should be stopped, or, if not, then made harmless by only sound and uniformly-sized apples being placed in front of the packer.

Slack packing is often due to what is known as the "flat pack," that is, the packing of the apple on the "stalk-end" instead of on the cheek. By following this method there is a liability of too many or too few apples being packed in a case, with the consequence that they arrive at their destination in either a bruised or "slack" condition. It was slack packing that led to the following comment by the Victorian Trade Commissioner in England on a consignment of 93 cases of Woolf River apples sent with others by the *Narkunda*:—"This lot was very slack; in fact, in most cases another row of apples could easily have been placed in the case. This applies to both $2\frac{1}{2}$ inch and $2\frac{3}{4}$ inch."

Departmental officers are aware that the consignor packs his apples on the "flat" or "stalk-end" of the fruit. Whilst fruit packed like this may have a good appearance when first packed, it rarely shows up to advantage upon arrival at its destination.

Co-ordination of Shipments Urged.

Before concluding, I would like to urge the necessity for exporters taking some steps towards organizing shipments from the various apple-growing States in such a way that the shipments to the various ports will be better distributed than has happened in the past. From information received from time to time it is apparent that too great a percentage of our apples are shipped to London and too few to other ports.

The arrangements of Victorian exporters appear to be better than those of shippers in other States. It seems to me that if some steps were taken by shippers in the two largest apple-exporting States—Victoria and Tasmania—to arrange for a more regular and uniform supply, beneficial results would follow.

Growers would also be well advised to pack more of their fruit under district brands, and so do away with the multiplicity of individual

brands that now exists. A step in this direction was made this year by the introduction of the "Opossum" and the "Diamond" brands. The fruit packed under these brands was very creditable, and it is to be hoped that other places will follow the example, and, having agreed on a district brand, endeavour to make certain that the presence of that brand is a sign of good fruit.

ARGENTINE'S BEEF EXPORT TRADE.

According to the Bureau of Agricultural Economics, United States of America, the exports of beef and beef products from Argentina in 1927 reached 1,838,439,000 lb., which was only 4 per cent. less than the record year, 1924. The figure for 1926 stands at 1,682,805,000 lb., which is over 1,000,000,000 lb. more than that exported from either Australia or Uruguay, the other two largest beef-exporting countries, and is 63 per cent. of the total beef and beef products exported from non-European countries during that year, compared with 53 per cent. as an average for the years 1911-13.

Frozen Beef.—Frozen beef exports in 1927 totalled 521,000,000 lb., against 1,089,225,000 lb. in 1918, and 732,000,000 lb. for 1913. Since 1918, frozen beef exports have been declining as the exports of chilled beef have grown in importance. For the first eleven months of 1927, 181,000,000 lb. of frozen beef went to Great Britain, against 168,000,000 lb. for the same period of 1926. Exports of frozen beef to Great Britain for the whole year 1926 reached only 196,000,000 lb., against 708,000,000 lb. in 1913, which was practically all of the frozen beef exported in that year. Germany, France, Belgium, and Italy now account for most of the Argentine frozen beef exports. In 1926, 2,000,000 lb. of that product were sent to the United States of America, against 6,000,000 lb. in 1913.

Chilled Beef.—The 1927 export of chilled beef, on the other hand, reached 1,028,818,000 lb., against 3,000,000 lb. in 1918 and 75,000,000 lb. in 1913. Great Britain is the leading purchaser of chilled beef, accounting for 941,000,000 lb. during the first eleven months of 1927, against 894,000,000 lb. for the corresponding period of 1926, and 74,000,000 lb. in 1913. The United States of America has never played an important part in that trade. Beef exporting to Europe from Argentina has been facilitated to a considerable extent by the fact that European countries have found important markets for their manufactured goods in Argentina, and ships properly equipped for the meat trade have been concentrated on those trade routes.

ORCHARD DRAINAGE.

By H. W. Davey, Chief Orchard Supervisor.

Very many people are under the impression that because of our hot summers there is little or no need for sub-drainage in the orchard. This is quite an erroneous idea. Sub-drainage allows greater root penetration than can occur on land not so drained, and the lowering of the water table permits the roots of trees to go much deeper into the soil, thus reaching moister conditions during the dry summer months.

The soil is in ideal condition, so far as water content is concerned, when it contains just about half the amount of moisture it is capable of holding. For example, a heavy clay soil can absorb water to the extent of about 40 per cent.; that is, 100 lb. of such clay fully saturated with moisture will contain about 40 lb. of water. The best condition for trees is when the soil contains much less than this amount, say, from about 15 to 18 per cent. If land carries a heavy percentage of water, the air between the particles of soil is forced out by the water taking its place, with the result that the soil becomes water-logged.

A lack of oxygen in the soil then prevents the chemical action taking place, which is vital to the health of the trees, the soil having become sour and inert.

From a physical aspect, soil may be divided into three parts. First, we have the soil proper consisting of the grains of different sizes and arranged in different ways, and consisting of insoluble soil minerals, or else minerals not readily capable of solution.

Secondly, the moisture that surrounds the soil grains, and it is in this moisture that is contained a varying amount of the soluble soil constituents on which the roots of trees depend for their nourishment.

The third part is the atmosphere which differs little from the air above the surface, excepting that its humidity is greater.

It can, therefore, be readily understood that, when soils reach a condition of complete saturation, all the air has been forced out of them, and its place taken by water. It is to prevent this water-logging of the soil with its harmful effects that sub-draining the orchard is carried out. It is therefore of the greatest importance that all excess water should be removed from the land as quickly as possible, and this is best achieved by means of tile-draining.

Water can often be prevented from entering land or can, at any rate, be quickly removed by means of surface drains; these are particularly useful for intercepting and carrying off water coming from higher levels.

Many trees in the irrigation areas are suffering from excessive water. This trouble could be remedied by sub-drainage. In numerous instances, however, water-logging of the soil takes place, not from excessive applications of water by the owner, but rather is it due to bad grading of the land, with the result that depressions have been left, and in these water collects in much greater quantities than is good for the health of the trees.

Another frequent cause of excessive moisture in some of the northern districts is that the water tables of roads adjacent to orchards are too

high, and consequently in wet weather the roads become more or less flooded, and instead of the channels carrying off surplus water from them it may happen that the water from the roads drains into the orchard with resultant damage to the trees.

If drain pipes are sunk into the ground as observation boxes, the height of the water table in the orchard can easily be ascertained, and this knowledge will prove to be very useful, and sometimes surprising.

To drain an orchard, it is generally agreed that a drain should be placed between every second row of trees. Thus, the first drain should be put down between the first and second rows, the second drain between the third and fourth row, and so on, until the whole of the orchard has been finished. Draining tiles of from 2 to 3 inches diameter and 12 inches long are the sizes most commonly used. When practicable, pipe drains should discharge into an open ditch, or else into a main drain of 4-in. pipes.

In cases where there is not a good get-away for the water, either by a natural fall of the land or else by draining into an underground drift, the water may be drained into a well from which it can be lifted by means of a windmill.

Wooden drains are not recommended under any circumstances.

The best time to carry out drainage operations is in late autumn, as the land is then usually in good condition for digging the drains. It is important that the drains should always follow the fall of the land, and never across the fall.

After levels have been taken and the lowest point ascertained, digging the trenches should be commenced. Special ditching tools should be purchased, for they will greatly facilitate the work.

The trenches should be quite narrow at the bottom, widening as they approach the surface of the ground.

In heavy clay soils drains should not be placed any deeper than 2 ft. 6 in., for if draining tiles be placed too deep in such ground, they become almost impervious to water from below, and it must be remembered that the water rises into the tiles from beneath them, and does not sink down into them. It is after the ground becomes saturated that the water rises into the pipes at the joints, and is then carried off.

After the trench has been dug for the reception of draining tiles, and the bottom carefully graded as to its fall, all crumbs of clay should be carefully removed from the bottom of the trench by an implement specially made for that purpose. The pipes are then laid along the bottom and butted up to each other as closely as possible, each tile being placed well into the clay. Care should be taken not to stand on the pipes after they have been placed in position at the bottom of the trench; this might displace some of them, especially if there be any soft patches of soil beneath them. The pipes must be laid in position straight and even; if the joints are not close together they may become silted up; this will encourage the roots of the trees to enter, and sooner or later the drains will become blocked, making it necessary to lift and relay the pipes.

When the pipes are in position, and before the soil is returned, they should be covered with either tarred or brown paper (the former being preferable), this prevents any disturbance of the pipes during

the filling in process, and also keeps soil particles from entering at the joints.

Grass sods should on no account be used as a substitute for the paper.

In filling in the trenches, about 6 inches of the clay sub-soil should be returned first; this should be firmly trodden down, after which the remainder of the soil can be returned as far as possible to its former position in the ground.

Where a job cannot be completed in one day, care should always be taken to protect the upper ends of drains, pending the resumption of work next day. This can be effected by closing the upper end of the drain by means of a bag or similar material, so that in the event of heavy rains occurring during the night the soil will not be washed into the tiles.

It is also advisable to protect the outlets of any completed drains with perforated zinc, so as to prevent the entry of small animal life.

Difficulties sometimes arise owing to yabbies (the so-called land crabs) working beneath the pipes at the joints during wet seasons and by puddling the clay, which is then carried away by the drains. This causes cavities to form beneath the tiles, allowing some of them to drop out of position, and siltation in the pipes follows. In these places, where yabbies are numerous, damage by them can be prevented effectually by placing sawn or split palings beneath the tiles when laying the drains.

It is a mistake to deeply trench land that requires sub-draining; this will only aggravate the evil by creating a reservoir for holding the water.

All land does not require draining; some, owing to its formation, drains naturally.

Investigation has shown that the cause of many of the soil troubles in irrigation areas is due either to the sub-surface being water-soaked from seepage, or else to the excessive use of irrigation water, which causes the rise of capillary water, the upward movement of which exceeds the downward movement of rain water. Where any of the water brought up from the depths of the soil contains salts in a soluble condition these will be deposited in the soil as the water evaporates.

Therefore, when there is a lack of rainfall the salts must be washed out of the ground by means of irrigation, and the water with its soluble salts carried away by means of underground drains. In such of the areas referred to a drift can usually be found by boring, into which the drains can be laid. In these cases a silt box must first be put down for drains to discharge into, so as to prevent the drift from becoming choked with silt or mud.

In heavy soils that are compact and impervious, drains should be laid shallow—never deeper than 30 inches.

In light open soils, drains should be placed deeper, say, from 3 to 4 feet, and further apart.

Hydrostatic water, or the water of complete saturation, is the cause of many orchards being unprofitable in Victoria, and unless it be removed by drainage it is impossible for such orchards to become payable propositions.

It is worth noting that land that is very wet during winter is usually very dry in summer. Trees growing on land of this kind are frequently thought to be suffering from attacks of root borer or armillaria, when the whole trouble is entirely due to an excess of water remaining in the soil for too long a period.

By under-draining land, water is prevented from rising for any length of time above a certain level, to the detriment of the roots.

The benefits derived from tile-draining of land are many, the most important of which are as follows:—

1. Increased health of trees owing to better root system.
2. Water is taken down through the soil, and not along its surface.
3. Less loss of plant food, such as humus and nitrogen.
4. Drained land is moister in summer and drier in winter.
5. Land can be cultivated earlier in spring and is warmer, as evaporation of surface water cools the soil.
6. Water-logged land excludes air, but in drained land the water sinks down, and air follows it.
7. The congenial soil for root pasturage is increased to the extent that the water-table is lowered.

ARGENTINE'S EXPORT TRADE IN CANNED MEATS

The following figures, taken from the *Review of the River Platte*, show the extent of exports for the past year, and, for comparative purposes, the total figures for the three preceding years. The importance of the United Kingdom and American markets is obvious:—

EXPORTS OF CANNED MEAT FROM THE ARGENTINE, 1927.

Country of Destination.	*Cases.*
United Kingdom	1,283,213
United States	675,466
France	71,021
Germany	101,674
Belgium	59,181
Italy	16,633
Holland	37,628
Norway	4,430
Sweden	4,585
Denmark	250
Spain	400
Brazil	1,250
Other countries	269,827
Total exports, 1927	2,525,558
Total exports, 1926	2,246,947
Total exports, 1925	2,165,034
Total exports, 1924	2,599,022

GREEN MANURING ORCHARD TREES.

By H. W. Davey, Chief Orchard Supervisor.

The harvesting of crops of fruit year after year depletes orchard soils of much of their plant food, and if the trees are to remain in a vigorous condition and continue to produce large and high-quality yields, the loss must be replaced.

It is now recognized that, in addition to yearly applications of chemical manures, the growing and ploughing under of a green crop is one of the methods for retaining fertility in orchard soils.

The intelligent management of the soil is based on a knowledge of its structure and composition.

A good soil may be said to consist of two parts. First, the organic matter largely derived from the presence or decay of vegetable matter, and the second part due to the presence of inorganic matter derived originally from rocks.

The growing and the ploughing under of a green, or cover crop, is chiefly for the purpose of adding humus and nitrogen to the soil.

Humus for our present purpose may be defined as vegetable matter in such an advanced state of decay as to have lost its original physical identity.

The term cover crop, or green manure, is now applied to any growth of weeds or crop to be turned into the soil while still in a growing condition.

The poorer the soil, the greater the necessity for a cover crop to be grown. The growing of a green crop in the orchard is primarily for the purpose of improving the fertility, and also the mechanical condition of the soil. In many orchards, owing to continual spring and summer cultivations, all weeds are killed, and, in some, even in a season like the present, there is little or no growth of weeds, and unless a green-manure crop is grown to meet the deficiency the land will become poorer and poorer.

In Victoria, peas, tick beans, or rye are most commonly used for green-manure crops. In America, clovers, beans, lucerne, and others, are employed for this purpose; but it is now generally accepted that leguminous crops, having their root systems well supplied with root nodules, obtain about two-thirds of their nitrogen from the air and the remaining one-third from the soil.

The value of adding nitrogen to the soil, by the ploughing under of masses of organic matter of any kind, can be better understood, when it is remembered that all organic matter contains nitrogen, and, in the case of legumes, the increase of nitrogen to the soil is very considerable. Nitrogen is one of the most important elements of plant growth, but before any of it can be absorbed by trees or plants it must first be brought into the soil.

Ammonia and nitrous acid, both compounds of nitrogen, are absorbed and brought down by rain, especially so, if the rain be accompanied by lightning discharges. This explains why plants derive so much more benefit from rain water than from an equal amount of water applied by irrigation or by means of a hose.

The atmospheric nitrogen in the soil is fixed by the activities of those micro-organisms commonly known as bacteria, the most important

of which, from a horticultural point of view, are those living symbiotically on the roots of leguminous plants.

The seed of a green-manure crop should be sown as early in autumn as possible, or very early in May, so as to obtain a good growth before the weather becomes too cold. The flowering stage in spring is the best time to plough under a leguminous crop, as at this period of its growth, the maximum fixation of nitrogen has been reached, and the crop should be ready to plough under in September. The crop itself is also at this time soft, and so will rapidly decompose. If too long a delay occurs before turning it under, seeds may form, and these will use up much of the nitrogen stored in the roots. Further, the rotting of the more mature plants is much slower, and even under the best conditions the softest plants are not sufficiently decayed for several weeks after they have been ploughed under. Therefore, the turning under of the green crop should be carried out at least a month before trees show active growth, so as to enable them to avail themselves of this added nitrogen to the soil.

It is a well-known fact to many growers of lucerne that a few bags of soil, taken from an old lucerne paddock, is of great assistance when establishing a new lucerne paddock. From a field in which lucerne has been well established for a long period, soil, to a depth of 5 or 6 inches, is scraped up and bagged, and from 3 to 400 lb. per acre is broadcast and harrowed in during cool weather, just before the lucerne seed is sown.

The explanation is that the soil taken from an old-established lucerne paddock teems with those minute plants known as bacteria, and it is now known that these micro-organisms live within the tissues of leguminous plants, and take up the free nitrogen from the gasses of the soil, just as plants and animals use oxygen

When these nodule-forming bacteria are present in the roots of legumes, the roots can obtain nitrogen from the air, but, if absent, the nitrogen must be secured direct from the soil, in the same way as other plants obtain their supply.

The bacteria inhabiting these roots are dependent mostly for their food on their host plant and extract the nitrogen from the air, and thus the host derives benefit from their presence.

The nitrogen-fixing bacteria are divided into two classes. One class lives independently in the soil and secures soil nitrogen for its growth direct. The lowly organisms of this class live their lives and die, and, as they decompose, the nitrogen contained in their bodies is released and becomes available to the roots of plants. The second is, from the orchardists' point of view, by far the most valuable, as the bacteria belonging to this class, live in a state of symbiosis on the roots of leguminous plants, and form the root-nodules so familiar to any one who has troubled to examine the roots of plants of this family.

The bacteria belonging to this class form nodules or tubercles on roots of certain plants from which the host plant obtains much of the nitrogen necessary for its growth.

Generally, bacteria, which form tubercles on the roots of legumes, vary on different species of plants. However, those to be found on lucerne roots are similar to those on clover roots, but such cases are not usual; therefore, it is always advisable that soil for "inoculation" purposes should, if possible, be taken from land on which a crop similar to that to be "inoculated" has been grown.

In soils lacking drainage, and therefore cold and sour, an abnormal decomposition takes place through bacterial action, resulting in a loss of free nitrogen from the soil; this is called denitrification.

Nitrogen can be added to the soil by means of commercial fertilizers containing this element, as, for example, nitrate of soda; but, in adding nitrogen to the soil by means of a green-manure crop, the land, not only benefits by the addition of organic matter; but, if a legume is used for the purpose, there is, further, the extra nitrogen stored up by the nodule-forming bacteria which is made available when the crop has been ploughed under.

In addition to those advantages the physical character of the soil is much improved in texture, and its water-holding content is increased, and, besides, its temperature is raised, which, in itself, is favorable to bacterial action. It can, therefore, be seen that, when a leguminous green crop is grown, the nitrogen content of the soil is much increased, while there are other benefits which should not be lost sight of.

The late-blooming stage is the best time to plough legumes under, as at that stage the plants are capable of "fixing" more nitrogen than at any other. The crop should first be disced and left to wilt; this makes the turning of it into the ground an easier matter.

Such winter-growing annuals as field peas, or tick beans, are excellent for the purpose of green-manure crops. Some growers use 1 bushel of tick beans together with ¾ bushel of peas to the acre; others sow 1 bushel of peas with a bushel of rye.

In cases where land is very deficient in humus 2 bushels of tick beans are used in place of the peas, with 1 bushel of rye or barley added.

Lime must always be present in fair quantities to enable leguminous crops to do their best in the fixation of nitrogen, and, if land be in any way deficient in lime, agricultural lime should be applied. Quick-lime, or even hydrated lime, should not be used, as this adversely affects the viability of seeds.

The nitrogen-fixing bacteria working on the roots of legumes must have favorable conditions of moisture, aeration, and temperature, also a lime basis.

Nitrification is twice as rapid at a temperature of 70° as it is at 50°, and twice as rapid at 90° as at 70°. These bacteria will not live in a higher temperature than about 100°.

The advantages of growing crops for green manure may be briefly stated as follow:—

1. They do much to maintain the moisture content of the soil.
2. They improve the texture of the soil.
3. They increase the temperature of the soil.
4. They promote bacterial action in the soil.

But to derive the full benefits from such a crop, the drainage must be good; otherwise the turning under of a mass of vegetation will tend only to increase the soil acidity.

Owing to the difficulty of now obtaining adequate supplies of stable manure, due to the displacement of the horse by motor traction, it is becoming more necessary every year to have recourse to green manuring for the purpose of maintaining the fertility of orchard soils.

THE BREEDING OF QUEEN BEES.

(Paper read at Victorian Apiarists' Conference, June, 1928.)

By J. S. Eagland, Apiary Inspector.

It would appear, from articles recently published in local journals, that much diversity of opinion exists among bee-farmers in Australia as to the variety of bee that is the most profitable, and also as to the best method of selecting bees for queen-raising.

In the effort to secure a better bee, importations of at least two varieties have recently been made. There are now available in the State, Black, Italian, and Carniolan bees, and pure stock can be obtained from them, or crosses from any of these breeds. I think, therefore, that, in view of the possibility of introduction of Isle of Wight disease, further importations are not desirable.

To my mind, any further effort to improve our bees should be by selective breeding from the best local stock available, and by local stock I mean queens whose worth has been proved in their particular district. An imported queen may be totally unsuited to our flora and climate.

In cases where the stock in any district is not considered suitable, I would advise prospective purchasers to endeavour to obtain queens from a district whose climate approximates to their own, and, what is more necessary, from a district with a somewhat similar flora

I have frequently noticed that queens selected on eucalypt country seem to prove more satisfactory on ranges of native flora than do queens selected on lucerne country, while in the irrigated areas the reverse holds true.

Many points require to be considered when selecting a breeder, but there are two (many would say but one) with which I particularly wish to deal; these are markings and colour.

It seems to me that the colour of the bee is dependent on locality, and is not a reliable indication of the insect's value as a gatherer of honey.

In North Africa, Palestine, Cyprus, and South Italy—all tropical areas—the native bees are all golden in colour. In temperate countries, such as North Italy, France, Spain, Austria, and parts of the Balkans, they are either brown or leather-coloured; while in the cold mountainous areas and in the northern countries of Europe bees are black. Bees native to a country or long acclimatized there have generally been found to be the most suited for commercial honey production in that country.

Observation has proved to me that bee-keepers who are breeding on selective lines, without introducing any new blood, are, in the colder parts of Victoria, evolving a darker bee than is being evolved from similar stock in our hot districts. Again, it is noticeable that in the hotter parts of the State the black bee is not by any means dominant.

It is well known that many bee-keepers will not keep a queen (no matter how good she is) as a breeder unless her bees all have three yellow bands.

I am of the opinion that insistence on this requirement has been a bar to the improvement in the quality of our bees in recent years.

The colour requirements of a breeder should not be computed in yellow bands, but in the evenness of markings, whether black or yellow; that is, every bee in the colony should be alike in colour, irrespective of what that colour may be. If this uniformity of colour is present, it will usually be found that the queen will breed true to type; and, while this is not essential, it can be taken as a reasonable proof of her power to reproduce progeny that will be good honey producers.

I am aware that many bee-keepers will differ from me on the ground that only pure stock breed true, and that adherence to the three-band test is the only way in which they can keep their bees pure.

Now, I am prepared to admit that I know of no way, except controlled mating, in which bees, or any live stock whatsoever, can be kept pure in blood, but I do know that colour can be maintained even in spite of cross-mating. This is quite a frequent occurrence with cattle, and I have secured the same result with bees.

From a queen producing perfectly black bees I have, in two crosses, produced a colony consisting wholly of three-banded bees, although in two crosses there still remains 25 per cent. of the blood of the colony from which a start was made. I am at present breeding from a queen producing two-banded bees, and as a breeder she is proving quite satisfactory.

So far, most of my criticism of our present system has been destructive. I now propose to give my ideas of what I consider to be a safe and progressive method of queen-breeding.

In every method of breeding, production should be the test, not appearance.

The queen should not only be tested for production, but should be also a tested breeder. By a tested breeder I mean a queen whose daughters have proved themselves, through their colonies, to be good honey producers. To prove a queen on these lines, I would advise the following procedure:—

Select, in their first season, several promising queens; from each of these raise several young queens and test them for the season.

Of the selected queens, the one whose daughters, under test, have given the best results may be considered to have proved herself the best breeder, and it is from this one that queens for the apiary should then be obtained. A queen so tested is the only one I consider to be entitled to be called a tested breeding queen.

Breeding on the lines advocated may result in the disappearance of the three-banded type in some districts, but experiments with other live stock have amply demonstrated that it is the only way in which any systematic increase in production may be obtained.

STALLION PARADES.

TIME TABLE, 1928.

PART II.*

Provided that the applications for registration received indicate that a horse will be in attendance there for examination, a parade will be held at each of the following places :—

No. and Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
No. 24.				
Monday, August 13 ..	Daylesford ..	Noon ..	11.55 a.m. ..	2 p.m.
Tuesday, August 14 ..	Waubra ..	10 a.m. ..	Driving ..	Driving
Tuesday, August 14 ..	Linton ..	2 p.m. ..	Driving ..	Driving
Tuesday, August 14 ..	Skipton ..	3 p.m. ..	Driving ..	Driving
Wednesday, August 15	Clunes ..	11 a.m. ..	8.36 a.m. ..	1.40 p.m.
Wednesday, August 15	Creswick ..	2.30 p.m...	2.13 p.m. ..	Driving
Wednesday, August 15	Kingston ..	3.30 p.m...	Driving ..	5.51 p.m.
Thursday, August 16..	Kyneton ..	10 a.m. ..	9.10 a.m. ..	Driving
Thursday, August 16..	Redesdale ..	2 p.m. ..	Driving ..	Driving
No 25.				
Tuesday, August 14..	Traralgon ..	10 a.m. ..	8.35 p.m. (13th)	12.5 p.m.
Tuesday, August 14 ..	Sale ..	2 p.m. ..	1.10 p.m. ..	6.40 a.m. (15th)
Wednesday, August 15	Maffra ..	9 a.m. ..	7.33 a.m. ..	10.50 a.m.
No. 26.				
Monday, August 13 ..	Warragul (Railway Station)	10.25 a.m.	10.25 a.m. ..	10.55 a.m.
Tuesday, August 14 ..	Bunyip ..	10 a.m. ..	9.34 a.m. ..	11.20 a.m.
Tuesday, August 14 ..	Pakenham ..	12 noon ..	11.46 a.m. ..	Driving
Tuesday, August 14 ..	Berwick ..	3 p.m. ..	Driving ..	8.39 p.m.
Wednesday, August 15	Cranbourne..	11 a.m. ..	8.17 a.m. ..	5.57 p.m.
Thursday, August 16	Wonthaggi ..	10 a.m. ..	9.5 p.m. (15th)	Driving
Thursday, August 16	Woolamai ..	3 p.m. ..	Driving ..	4.35 p.m.
Friday, August 17 ..	Lang Lang ..	9.15 a.m...	6.16 p.m. (16th)	9.43 a.m.
Friday, August 17 ..	Dandenong..	11.30 a.m.	11.5 a.m. ..	12.18 p.m.
No. 27.				
Wednesday, August 22	Willaura ..	10 a.m. ..	10.30 p.m. (21st)	2.19 p.m.
Thursday, August 23	Nhill ..	3 p.m. ..	1.6 a.m. ..	1.9 a.m (24th)
No. 28.				
Monday, August 20 ..	Korumburra	11 a.m. ..	10.52 a.m. ..	Driving
Monday, August 20 ..	Leongatha ..	2.30 p.m...	Driving ..	11.28 a.m. (21st)
Tuesday, August 21 ..	Yarram ..	3.30 p.m...	2.35 p.m. ..	7 a.m. (22nd)
Wednesday, August 22	Foster (Railway Station)	12 noon ..	8.4 a.m. ..	Driving
Wednesday, August 22	Stony Creek	2 p.m. ..	Driving ..	Driving
No. 29.				
Tuesday, August 21 ..	Mernda ..	11 a.m. ..	10.32 a.m. ..	1.34 p.m.
Tuesday, August 21 ..	Whittlesea ..	2.30 p.m...	1.50 p.m. ..	7.45 p.m.
Wednesday, August 22	Lilydale ..	2 p.m. ..	1.59 p.m. ..	4.56 p.m.
Thursday, August 23	Romsey ..	11 a.m. ..	10.21 a.m. ..	Driving

* The Time Table for the period prior to the 13th August was printed in this *Journal* for May last.

STALLION PARADES, TIME TABLE—*continued.*

No. and Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
No. 30.				
Wednesday, August 29	Frankston ..	12.51 p.m.	12.51 p.m. ..	2.20 p.m.
Friday, August 31 ..	Ballarat ..	2 p.m. ..	11.8 a.m. ..	6.15 p.m.
No. 31.				
Tuesday, August 28	Orbost ..	10 a.m. ..	6.25 p.m. (27th)	10.55 a.m. (29th)
Wednesday, August 29	Nowa Nowa	12.3 p.m.	12.3 p.m. ..	9.39 a.m. (30th)
Thursday, August 30	Bairnsdale ..	Noon ..	11.30 a.m. ..	2.15 p.m.
No. 32.				
Wednesday, August 29	Ensay South	11 a.m.	11 a.m. ..	11.10 a.m.
Wednesday, August 29	Omeo ..	3 p.m. ..	3 p.m. ..	6.25 a.m. (30th)
No. 33.				
Wednesday, Sept. 5 ..	Sunbury ..	11 a.m. ..	7.38 a.m. ..	2.56 p.m.
No. 34.				
Wednesday, Sept. 19	Royal Show	1.30 p.m.		
Thursday, Sept. 20 ..	Royal Show	9 a.m.		

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1928.

Description of Fertilizer.	Brand.	Nitrogen.				Phosphoric Acid.				Potash.	Price charged per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood and Bone.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	£ s. d.	
Blood and Bone	Arch	..	..	7·00	7·00	..	6·41	4·59	11·00	..	11 0 0	Amalgamated Freezing Co. (Vic.) Pty. Ltd., 499 Little Collins-street, Melbourne
Bone Fertilizer ..	Bailey Bros. ..	..	..	2·15	2·15	..	6·50	9·50	16·00	..	7 10 0	Bailey Bros., Mount Clear
Sulphate of Potash	Pivot ..	..	..	..	..	..	..	..	..	48.50	14 0 0	Phosphate Co-Op. Co. of Aus. Ltd., 440 Little Collins-street, Melbourne
Complete Manure	Nitrophoska I.G., BA over SF in circle	4·5	11.5	..	16.0	15·2	1·3	..	16·5	20.0	23 0 0	Dyes and Chemicals (Aust.), 573 Lonsdale-street, Melbourne

P. RANKIN SCOTT,

Chemist for Agriculture.

Melbourne, 16th May, 1928.

GREAT BRITAIN'S FROZEN MEAT TRADE.

It is stated in a recently published review of the chilled and frozen meat trade for 1927 by Messrs. W. Weddel and Company, Limited, that much of the dissatisfaction with the conditions at Smithfield and in the country was probably due to the almost continuous over-supply of chilled beef, which affected every other class of meat, including home-grown. In home-killed meat alone the quantity passing through Smithfield Market was 16,055 tons (or 22.5 per cent.) more than in 1926. This was the response of the farmers of Great Britain to the embargo on imports of fresh meat from the Continent. The average price of nearly all descriptions of imported meat experienced a further decline last year, and, comparing the average prices of all descriptions of frozen and chilled meat with those ruling in 1913, last year's figure was only 26 per cent. above the pre-war level.

Importations of frozen and chilled meat into the United Kingdom during 1927 amounted to 946,776 tons, as compared with 930,035 tons in 1926, an increase of 16,741, or 1.8 per cent. Chilled beef showed an increase of 36,692 tons and frozen beef a decrease of 29,336 tons, so that in weight the imports of beef were very little heavier. In quantity, however, the increase amounted to 270,289 quarters, the explanation being that the average weight of the quarters received from the River Plate last year was lower than in the preceding year.

The quantity of New Zealand lambs imported was the largest for many years, but the quality of many of them fell short of the usual standard. The only European country able to ship meat to Great Britain last year was Iceland, from which 28,175 frozen and chilled lambs were received. Arriving at a time when the market was well supplied with the home-killed article, these lambs experienced a poor demand, which was further discouraged by their indifferent quality. The demand for imported meat in the various Continental countries received a further slight set-back last year owing to the increased supplies and low price of fresh-killed meat. The total shipments to Continental destinations during 1927 amounted to 300,565 tons, as compared with 316,800 tons in 1926 and 476,000 tons in 1924. The total consumption of meat in the United Kingdom in 1927 is estimated at 2,048,645 tons, of which 1,123,200 tons were home-grown and 925,445 tons imported, the proportions being 54.8 per cent. home-grown and 45.2 per cent. imported. Pork and bacon are not included.

SOUTH AFRICAN PIG INDUSTRY.

Early in the present year—1927—a conference of pig breeders met in Pretoria on the invitation of the South African Agricultural Union. It was attended by delegates from many important bodies, including the Pig Breeders' Society of South Africa, and by officers of the Department of Agriculture. The conference resolved unanimously that the South African Agricultural Union be requested to appoint a committee of inquiry into the pig industry. It was shown that the normal production of pigs and bacon was more than sufficient to meet local requirements, and that if the industry was to expand some method of co-operative curing must be found, and efforts must be made to develop a bacon export trade with the United Kingdom.

It was also resolved to request the Government to appoint additional extension officers to travel round the country and advise farmers on the most practical and economical methods of producing first-class bacon pigs.

This conference was followed a week later by another, convened by the Department of Agriculture and attended by bacon manufacturers of the Union. The object in view was to discuss ways and means for improving the pig industry, but particularly in regard to the production of bacon. Many matters connected with the industry were discussed, and the following resolutions were passed:—

1. That all pigs killed at bacon factories throughout the Union should be inspected in the carcass by Government officers or persons holding Government authority.

2. That all products from such carcasses may be offered for sale throughout the Union without further compulsory inspection; local authorities, such as municipalities, to retain their right of inspection on traders' premises.

3. That in future no new bacon factory be allowed to be established unless the quota of pigs to be handled by such factory is sufficient in number to warrant provision being made for veterinary inspection.

4. That bacon factories are prepared to make the necessary discrimination in the case of well-finished baconers of good quality on carcass examination and to pay the highest ruling market prices to suppliers of such pigs accordingly.

5. That more efficient utilization of by-products be made by bacon factories in future in order to reduce the cost of production of the primary articles, namely, bacon and ham.

6. That this conference is in favour of adopting the levy principle, and that such levy be made on all pigs slaughtered in the Union whether the carcasses are used for commercial purposes or offered for sale on the farm.

The conference also discussed the advisability of considering a system of grading bacon for export as well as for local consumption, and a "Curers' Committee of Inquiry" was forthwith appointed to look into the matter further. This committee, on completion of their inquiries, will meet the committee appointed by the South African Agricultural Union, referred to above, in order that a common understanding may be arrived at. In the meantime, the Department of Agriculture will closely consider the resolutions passed by the manufacturers. Altogether, it would seem as though considerable developments might be looked for in the South African pig industry in the near future.

RATIONS FOR FATTENING COCKERELS: CANADIAN EXPERIMENT.

The Dominion Experimental Station, at Kapuskasing, Ontario, commenced in 1922 an experiment for the purpose of answering the following questions:—(1) Are home-grown feeds suitable for crate-fattening? (2) Does it pay to buy a commercial feed such as maize and add it to the home-grown feeds? (3) Would it pay to use all commercial feeds rather than all or part home-grown? (4) Could tankage and water take the place of skim-milk in a fattening ration?

The experiment has been conducted for four years, and in two of those years with duplicate lots, using in all 432 birds in the test. Each lot comprised 72 well-grown cockerels, which were divided equally as to weight and general development and placed in six crates, each crate having three compartments holding four birds. The birds were all housed in the same quarters and received the following rations:—

(1) Equal parts of wheat, oats, barley; plus skim-milk.
(2) Equal parts of wheat, oats, barley; tankage 15 per cent. and water.
(3) Equal parts of wheat, oats, barley, maize; plus skim-milk.
(4) Equal parts of wheat, oats, barley, maize; tankage 15 per cent. and water.
(5) Equal parts of maize, low-grade flour, middlings; plus skim-milk.
(6) Equal parts of maize, low-grade flour, middlings; tankage 15 per cent. and water.

The wheat, oats, barley, and maize were finely ground and the coarser hulls were removed from the oats and barley, the expense being charged up to the pens concerned. In all cases the feeding period covered 21 days or 42 feedings. The birds were starved for 24 hours before the first feeding. The feeds were valued at market prices. Cost of labour was negligible.

The following results were arrived at:—(1) Home-grown feeds are quite suitable for crate fattening. (2) Maize improves the home-grown ration, especially if milk is to be used. (3) Commercial feeds other than maize need not be purchased in order to obtain the best results if a supply of home-grown feeds is available. (4) In all cases skim-milk was found superior to tankage and water in the fattening ration, from the stand-point both of gain and of profit. (5) Good results may, however, be also obtained from the use of tankage and water if no milk is available. (6) Crate-fattening is profitable.

EGG PRODUCTION IN CANADA.

The importance of the production of eggs in Canada's agricultural output is to be seen from figures recently issued for 1927 by the Dominion Bureau of Statistics, which give the estimated production of farm eggs as 253,277,227 dozen, valued at 80,110,010 dollars. This represents an increase of 6.8 per cent. in quantity and 21 per cent. in value over 1926, the figures for the preceding year being 237,080,399 dozen, valued at 66,198,285 dollars. Increasing steadily year by year the output of farm eggs has gained by over 50 per cent. since 1921, while the value has just about doubled. The average value placed on farm eggs in 1927 was 31.6 cents per dozen, compared with 27.9 cents in the previous year.

The most remarkable thing about the 1927 report on farm egg production is that the gain in output of nearly 7 per cent. was accomplished without a corresponding increase in the number of birds in the farm flocks. In fact, the number of hens, &c., on Canadian farms increased only one-sixth of 1 per cent. between June, 1926, and June, 1927, or from 46,095,597 to 46,172,095. It is apparent, therefore, that Canadian farmers are making considerable progress in the culling of undesirable hens and replacing them with stock of high egg-production strain.

Separate figures are not yet available for the number of egg-producing hens on the farms in 1927. Taking the total flocks, including non-producers, the output per bird was highest in British Columbia at 81 eggs in the year. Ontario had an output of 70.5 eggs per bird, and the other provinces from 60 to 61.5.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

PRUNING.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into

the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur, nicotine—sulphate, or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Paeonies, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

HORSES.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal

disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. If any sign of milk fever, treat cows as suggested in leaflet obtainable from Department of Agriculture. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results. Write to Department for leaflet on "Rearing Calves."

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Feed pigs a balanced ration in automatic feeder. Provide plenty of charcoal and bone meal. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin. This may be given in the food, or from half to one teaspoonful of oil of turpentine in milk or castor oil. Provide green crops for pigs to graze, i.e., oats, barley, rape, artichokes. By grazing on green crops with balanced ration in self-feeder, better and more economical results will be obtained. Good grass and clover or lucerne or millet for summer grazing are very satisfactory. Always provide plenty of clean water for pigs to drink, especially suckling sows. These also will do much better when grazing than when confined to a sty.

SHEEP.—Late lambing in the wetter districts of the State should end with this month. Late lambs are usually the result of joining the rams as late as March; this should be confined to strong cross-breds and sheep with a predominance of English blood. Lambs dropped in August do well if the district be late or if there be available for them before they are weaned summer grasses and forage. In most places such feed can be grown only by means of irrigation.

In the early northern districts of the State preparation is now being made for shearing. Early shearing is advisable where it is intended to fatten quickly old ewes, early-dropped lambs and two-tooth wethers unsuitable for wool production.

The decision should now be made as to the breed and number of pure-bred rams required for the coming season. Place orders as soon as possible; breeders can then give satisfaction and allot preference to early applicants only. Purchase rams from registered flock-owners. Breed and class should be given most careful consideration. Certain districts and pastures suit one breed or cross better than another. This knowledge can be gained only from the experience of others, or by trial after mature judgment by the sheep-farmer himself.

POULTRY.—Yards should be turned over with a spade or fork, and sown down with rye grass, rape, or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators, disinfect; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

CULTIVATION.

FARM.—Work land where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds.

ORCHARD.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

FLOWER GARDEN.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

VEGETABLE GARDEN.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before middle of month, at latest. Conclude pruning and tie down rods. The value of the prunings for use as "smudge fires" to protect against spring frosts should not be overlooked. A deep winter ploughing is strongly recommended. This must be completed before root action starts in August. The roots may be cut with impunity whilst the vine is dormant, but to do so after root action starts injures the vine. Preventive swabbing with acid iron sulphate solution, of sultanas and other susceptible sorts, to control vine Black Spot, is emphatically urged. Though no damage was caused by this fungus last season, it showed itself in many localities. A showery spring would permit its rapid spread on untreated vines. Neglect of swabbing may spell disaster. A bulletin dealing with Black Spot and its treatment will be supplied on application. In some districts erinose will necessitate treatment. Swabbing and also spraying with lime-sulphur (1 in 12) at the close of winter are effective against this mite.

CELLAR.—Rack again, towards end of month (spring racking), wines which have as yet only been once racked. Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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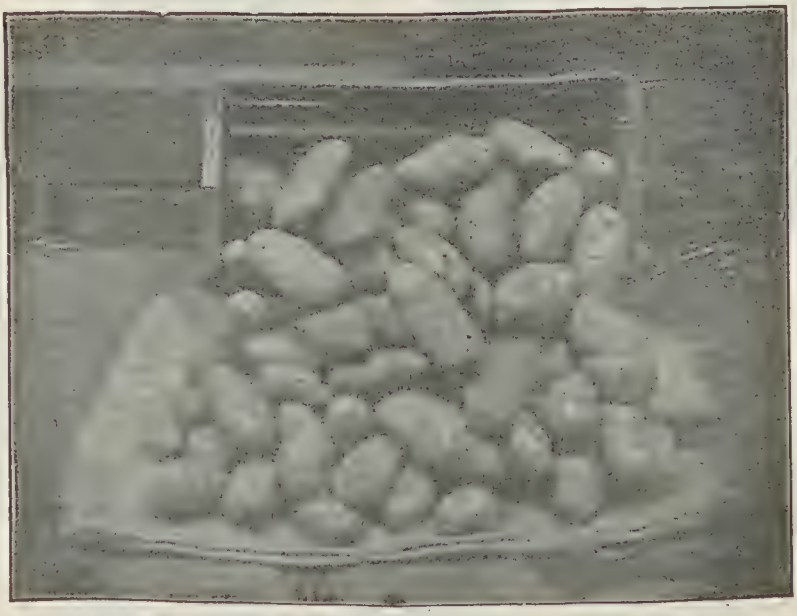

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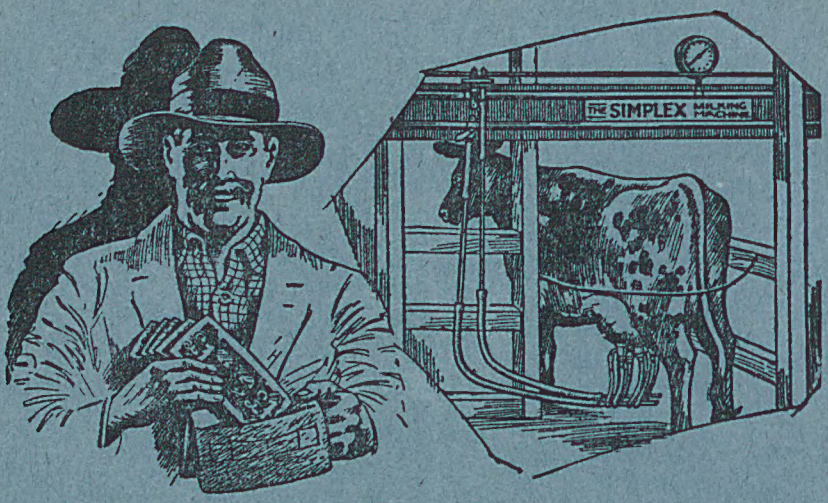

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